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THE
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Vol. XXXIV DECEMBER, 1924 No. 12

ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding that they are contributed exclusively to THE LARYNGOSCOPE.)

STUDIES OF THE RINNE TEST WITH SPECIAL REFERENCE TO THE TUNING FORK STEM FOR BOTH BONE AND AIR CONDUCTION.

DR. ROBERT SONNENSCHEIN, Chicago, Ill.

The summary about to be presented is based largely upon a number of papers published by the writer during the past seven years. Among these are "A Suggestion Regarding the Rinne Test", published in June, 1916; "A Study of the Rinne Test in One Hundred Cases", published in March, 1922; and "The Use of the Tuning Fork Stem for Both Air and Bone Conduction in the Rinne Test", by Dr. Minton and myself, published in March, 1923. (These were all read at medical societies some considerable time before the respective publication.) These articles have taken up the Rinne test from various points of view. We have felt that this tuning fork test is probably the most valuable of all in that it furnishes so much information regarding the localization of the lesion of hearing by giving the ratio of air to bone conduction. In fact, by utilizing the bone conduction factor, one may perhaps dispense with the Schwabach test as such, provided the bone conduction by way of the mastoid is preferred to that obtained by way of the vertex, as in the original Schwabach test. In my article "A Study of the Schwabach Test in One Hundred Cases", I call attention to the fact that "many authorities test bone conduction by way of the mastoid, and it would seem, in view of the results obtained in this series, that the bone conduction factor of the Rinne test could serve as the Schwabach, thus eliminating testing by way of the vertex or

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forehead except where the Weber test is deemed advisable, and the Schwabach is then done at the same time by the same maneuver."

Section I. In the first of the papers above mentioned, we called attention to the fact that air conduction as compared with bone is really much greater than ordinarily assumed. Bezold, in his text book, considers that on the average air conduction is about thirty seconds longer than bone in the normal positive Rinne, using a^1 fork (435 d. v.). However, in one of his great papers on functional testing of the ear, he states that when the fork is held only at the meatus without having been previously placed on the mastoid, the duration of air conduction is much longer than when the usual Rinne is done; in fact, it lasts seventy to eighty seconds. This is, of course, due to the fact that when the stem of the fork is placed against the bone the excursions of the instrument are interfered with and the duration of the vibration thereby shortened. In another article he calls attention to the fact that when the Rinne test is carried out in the usual manner and the fork no longer heard with the prong near the meatus, if then the stem is inserted into the auditory canal, the fork is again heard by way of air, and usually for a period of about twelve seconds. This method I have used only in a number of cases but obtained good results which will be mentioned later on. Since pressure of the stem against the meatal walls tends to diminish the duration of the fork's vibration, even this test does not show the full extent to which a fork may sound. Bezold claims that "we could really determine the length of hearing by air conduction only, if we were able to approach the drum membrane as closely with the prongs as we do with the stem of the fork."

In order to assure within reasonable limits equal application of force in exciting the a^1 fork, I always hold it at right angles to the body and allow a small pleximeter (armed with a rubber pad) to fall of its own weight from a perpendicular position striking the flat surface of the prong. By not using any force except that produced by gravity upon the head of the hammer, the personal element of variation in the impulse imparted to the fork is, we believe, almost entirely eliminated. If, indeed, there is a slight difference of a few seconds in the fork's vibration, this should not materially influence the result. By this method, in testing the same individual several times as a matter of control, there is in intelligent persons rarely noted a difference of more than two to five seconds. We can realize that many will contend that since the Rinne, as done in the usual way, gives us a good a ratio of the air to bone conduction as is needed for diagnosis, there is no necessity of further complicating the test by determining the air conduction alone after doing the

regular test. However, true this may be, it is equally certain that we do not in this manner really find out the actual or approximately actual duration of the air conduction. But even if unnecessary for the ordinary practice of otology, is it not worth while to perform a procedure which requires one or two moments in any case, and which may in time throw more light on the auditory function? These statements, of course, refer only to the positive Rinne, for in the negative one the full duration of air conduction has been found before the fork is placed on the mastoid.

In order to observe the difference between the air conduction as shown after the fork is no longer heard on the mastoid, and that noted by air conduction alone, twenty-five examination records of pathologic cases and twenty-five with normal ears were tabulated. An analysis of these data shows that in the one hundred ears thus examined the excess of hearing by air alone over that shown in the regular Rinne was thirteen seconds as compared with Bezold's average of twelve seconds. In the pathological cases (fifty ears) the average was 10.7 seconds; in the normal cases (fifty ears) it was 15.2. The least difference was five seconds in a few instances and the greatest was thirty seconds, in one case. The percentage of increased air conduction when all cases were considered (one hundred ears) was 28 per cent. In the pathological cases the average was 27 per cent, some being as low as 8 per cent and one as high as 66 per cent. It is interesting to note that there is thus very little difference between the reaction shown in the pathological cases of this series at least, as compared with the normal ears. It is true that of the so-called pathologic ears the majority were tubal catarrh or slight nerve degeneration. Perhaps the study of a series of marked nerve lesions would show different results. It is rather stiking that in many comparatively young individuals with negative ear findings, the fork is often heard only a short time by way of the mastoid, *e. g.*, twelve to fifteen seconds whereas the majority heard by way of bone from eighteen to thirty seconds.

Section II. There are at least seven or eight varieties of Rinne reaction.

1. Two forms of the positive Rinne: (a) Positive, in which the air conduction is much longer than the bone conduction, but both are normal in duration; this is the normal positive Rinne. (b) Positive, air conduction longer than bone conduction but both of them shortened as compared with the normal duration; this form is found in internal ear trouble, with impairment of hearing.

2. Three forms of the negative Rinne: (a) Bone conduction considerably increased and longer than the air conduction, which latter

is moderately diminished; this form is found in the ordinary middle ear disease. (b) Bone conduction longer than air, but both diminished as compared with the normal; here we often find a combination of internal and middle ear disease. (c) Bone conduction greater than air but both very much shortened; this form occurs in very far advanced ear disease, because air conduction is then lost more rapidly than the bone.

3. "Indifferent" Rinne. Of this there are two varieties: (a) Air and bone conduction of equal length because air conduction is slightly diminished and bone conduction slightly increased; hearing is usually good in this form, in which a slight middle ear affection is usually the condition present. (b) Air and bone conduction equal in duration but both of them much shorter than the normal; in this form the hearing is very poor, as this reaction is usually found in cases of serious internal ear disease.

4. "Infinite" Rinne. If not heard at all by air but somewhat by bone, we have the so-called infinitely negative Rinne; this is often found in cases of far advanced internal ear disease. While it seems almost impossible to have a positively infinite Rinne, that is, heard somewhat by air but not at all by bone, still we have found it in two of our cases.

Politzer thus summarizes the uses of the Rinne: "(a) The test is very important in cases of marked impairment of hearing, with involvement of the conduction apparatus where other objective diagnostic signs are lacking. In the majority of such cases the Rinne is negative provided no complication such as nerve degeneration is present. (b) The negative Rinne more definitely indicates conduction impairment, the greater the difference between the time during which the fork is heard via air, and the duration of its appreciation by bone conduction. The diagnosis is further supported by the loss of hearing for low tones, the relatively better hearing for the high tones, and the prolongation of bone conduction (Schwabach test). (c) In the middle ear disease with only moderate diminution in hearing, the Rinne is of only slight diagnostic import, since most of these cases are positive, despite some prolongation of bone conduction. This is seldom seen in cases of suppurative otitis media with perforation of the drum membrane. Bruehl found in using the lower forks that the Rinne is sometimes negative even when no marked disturbance of hearing is present. (d) In unilateral middle ear disease with markedly impaired hearing the diagnostic value of the Weber is greater than the Rinne. (e) In elderly individuals in whom as a rule bone conduction is shortened, the Rinne often gives no accurate information. (f) Likewise in cases of advanced auditory

nerve affection complicated with middle ear disease, the Rinne often gives the indefinite results. (g) Even where the Rinne is positive in cases of severe impairment of hearing a diagnosis of disease of the auditory nerve can only then be made if supported by corroborative history, course of the disease and symptoms, together with such findings as loss of hearing for the upper tones, relatively good hearing for the lower tones and diminished bone conduction." The same author maintains that even though in exceptional cases this test may be positive in middle ear involvement, accompanied by poor hearing, and negative in severe labyrinthine diseases, these facts do not materially lessen the value of the Rinne when it is used in combination with other diagnostic tests.

Bezold's conclusions regarding the Rinne test are:

1. "In all bilateral diseases of the ears where the difference in hearing betwen the two sides is not too great, a negative Rinne shows the presence of a change in the conduction apparatus. But the converse does not always obtain, for a shortened of even positive Rinne may be had (a) in chronic cases where the findings with otoscope or catheter are negative, and the hearing for whisper is above one meter, and (b) in acute or subacute otitis media with exudate in the tympanum and a marked diminution in hearing.

2. "In a severe unilateral affection the Rinne may be negative, even though the conduction apparatus is intact.

3. "When the positive Rinne is of normal duration or only slightly shortened, and the hearing greatly impaired but the speculum and catheter findings are normal, then any material involvement of the conduction apparatus may be excluded, regardless of the unilateral or bilateral character of the condition present."

We obtained our findings from the examination of one hundred consecutive ear cases in whom complete functional tests were performed. The forks used in this series were the unweighted a^1 (435 d. v.) the weighted c^1, (154 d. v.), and the unweighted A (108 d. v.) forks of Edelmann. In order to have uniformity in the duration of vibration the forks were always made to functionate by holding them at right angles to the body and allowing a small rubber pleximeter to fall from a perpendicular position directly upon one of the prongs as previously stated. The A fork (108 d. v.) was excited by allowing it to fall from a perpendicular position to a horizontal one, striking the knee. The forks were held as loosely as possible by the stem and permitted to rest on the head without any other pressure than that due to the weight of the fork particularly when using the A fork. When any uncertainty seemed to exist in the mind of the patient, the tests were repeated many times, care

being taken to avoid all suggestion. The difference between hearing a fork and feeling its vibrations was explained to each individual and demonstration made by placing the vibrating forks on patella, fingers and elsewhere.

While my figures (as shown in the original paper illustrated with tables and summaries) for the time during which the forks were heard by the patient may be longer than those given by most writers, let me say that in order to get accurate results the tests were performed in a quiet room and many times repeated in order to check the findings, often more than two hours being spent on a single case. The analysis of the data obtained from the one hundred cases examined (that is, two hundred ears), is as follows: The cases were divided into three groups: 1, Those in which both ears had a positive Rinne (45 cases). 2, Those in which one ear showed a positive and the other a negative Rinne (35 cases), and 3, Those in which both ears had a negative Rinne (20 cases).

Averages for the A fork (108 d. v.): (a) Differences in duration of hearing by bone and air conduction in the 45 cases in which both ears were positive averaged 68.9 seconds; in 35 cases with one ear negative and the other positive, the average was 42.5 seconds; in the 20 cases with both ears negative the average was 60.3 seconds; for all the ears examined, the grand average was 57.2 seconds. (b) The percentage or ratio between the bone and air conduction in Group 1 was 212.8 per cent; in Group 2, 194.9 per cent and in Group 3, 342 per cent or a grand average of 250.2 per cent.

Averages for the weighted c^1 (154 d. v.) fork: (a) Difference in duration for hearing by bone and air conduction in Group 1, 55.9 seconds; Group 2, 34.9, and in Group 3, 40.3, or a grand average of 43.7 seconds. (b) The percentage or the ratio between the bone and air conduction in Group 1 was 200.8 per cent; Group 2, 173.2 per cent and in Group 3, 235 per cent or a grand average of 209 per cent.

Average for the a^1 fork: (a) Difference in duration for hearing by bone and air conduction in Group 1, 41.9 seconds; Group 2, 26.9; Group 3, 26.9 or a grand average of 31.9 seconds. (b) The percentage or the atrio between the bone and air conduction in Group 1 was 221.8 per cent; Group 2, 182.1 per cent; and in Group 3, 229.2 per cent or a grand average of 211 per cent.

The total average of difference in duration of hearing by bone and air conduction in the 200 ears and the three different forks amounts to 44.2 seconds, and the total average of percentage or ratio of air to bone or vice versa is 223.4 per cent. Judging from these figures, we may say that in this series of cases at least, with

all the forks used, the ratio of air to bone in the positive Rinne and of bone to air in the negative Rinne was about 200 per cent or two to one.

Among the conclusions that we drew were: First, That the Rinne is probably the most valuable of the tuning fork reactions used in functional ear testing. Second, The forks most often employed in performing the Rinne test seem to be c (128 d. v.), the weighted c^1 (154 d. v.), the unweighted c^1 (256 d. v.) and the unweighted a^1 fork (435 d. v.). Third, Of these forks the unweighted a^1 (435 d. v.) seems best suited for performing the Rinne test for these reasons: (a) It is very easily handled because of its compactness; (b) Its vibrations are such that when the fork is placed on the mastoid the sound is not carried by way of the air to this ear (that is, provided the auricle is not touched); when testing air conduction the sound is not transmitted to the other ear; and lastly, its pitch lies directly in the so-called "speech area" of Bezold, and, if heard by air, it usually means that the patient has some perception for the voice. The findings of the Rinne test alone cannot make the diagnosis as a rule, but it is of great aid when combined with other diagnostic measures.

Section III. In the paper on "The Use of the Tuning Fork Stem for Both Air and Bone Conduction in the Rinne Test", by Dr. Minton and myself, attention was called to the fact that "we always felt that placing the fork's stem in the meatus did not give hearing ing only by air, but that the contact with the tissues gave some transmission by way of the cartilage and bone". In the paper entitled "A Study of the Rinne Test in One Hundred Cases" the writer (Sonnenschein) called attention to the fact that Boenninghaus quotes Zimmerman and Quix, who deny all value to the Rinne test because it measures the difference between two factors, namely, the vibration of the fork's stem and its prongs, which are so different that they are not comparable. Others have also raised the same objection to this test. Boenninghaus admits this but says that since we make the same error in each test, the results can be compared with one another and that suffices for the practitioner even if it does not for the physicist. This point of Boenninghaus' is supported by the practical experience of innumerable otologists, namely: that the Rinne test as usually performed gives us the ratio between bone and air conduction and furnishes us most valuable information, but it seemed to us desirable to demonstrate if possible that air conduction could be tested by means of the fork's stem. In that case the stem would be employed for both bone and air conduction factors of the Rinne and the theoretical objection of Zimmerman and others

overcome. While the prongs move in transverse vibration of large amplitude the stem at the same time and for just as long a period shows longitudinal vibrations of smaller amplitude. It is desirable from the acoustic viewpoint to test both air and bone conduction with the same type of vibration. The present method of testing air conduction with forks is subject to a series of objections because of the disturbance of the intensity of sound surrounding the prongs of the fork. The prongs, as is well known, move in opposite directions so that when a condensation and a rarefaction are propagated outward these very nearly but not exactly overlap, with a resulting interference of sound. Thus the intensity of the sound changes greatly with slight rotation of the fork about the vertical axis; but it also changes in a modified manner at various distances from the stem. In addition to these factors there is another one of great importance, namely: the slippage of air molecules around the prongs of the fork which varies with the amplitude and velocity of motion of the prongs and causes a further modification of the sound intensity about the fork. Moreover, all of these factors vary with the pitch, so that it is evident that air tests made in the usual manner are subject to much variation in precision. There can be no such variation as this of the sound intensity in the air surrounding the stem of the fork, and for this reason tests of air conduction made with the stem in the manner reported herein are not subject to these objections.

Anticipating what is to follow, it may be noted that there is little loss of sound energy through the walls of rubber tubing into which the stem of a fork is inserted. Nearly all of the sound is transmitted along the air column, and little if any at all is propagated by molecular conduction along the wall of the tube. The question of the length of the tubing is therefore not of great physical importance, and its decision may be left to each individual otologist, with the proviso that not too wide a tube be used, lest it act as a resonator (a diameter of from 0.5 to 0.8 c.m. is recommended).

The method employed is to excite the fork in the manner chosen by the individual otologist endeavoring, however, to do this in a definite way in order to get uniform results as previously described. We used the a^1 fork (435 d. v.) of Bezold. The stem is held against the mastoid process in the usual manner and the duration of hearing by bone conduction noted. The stem is then inserted into one end of a rubber tube, the other end of which is attached to a vulcanized rubber olive-shaped tip (such as often is used with a Politzer bag), and the latter inserted into the meatus auditorius externus, care being taken that the lumen of the tip is not occluded by contact

with a part of the concha or wall of the meatus. The duration of hearing by way of air conduction is then noted. The dimensions of the tubing used were: Length, 51 c.m.; width of lumen 0.7 c.m., and thickness of wall 1.5 m.m. Clinically this method of doing the Rinne test was carried out on 35 cases. First the test was performed in the usual Rinne method and then repeated by means of the rubber tubing as described. In 23 of these cases, the air conduction in both ears was 3 to 15 seconds longer when the fork was connected with the tube. This group included 4 normal ears, 5 cases of nerve degeneration, 8 combined middle and internal ear cases, and 6 cases of pure middle ear affection. In 2 cases (one normal, the other with a chronic otitis media with some nerve change), the hearing in both ears by way of the tube was the same as when the prongs were held near the ear in the usual manner. In 5 cases, only one ear showed the same length of hearing by both methods. The fork was heard a shorter time with the tubing than with the prongs of the fork by from 2 to 10 seconds in 9 cases, of which 2 were moderate nerve degenerations, 1 a combined middle and inner ear involvement, 4 showed either tubal catarrh, acute or chronic otitis media, and 2 were otosclerosis.

The fact that some cases with very distinct middle ear affection and a negative Rinne showed less hearing for the fork by way of the tubing and tip than when the prongs were held near the ear, seems to show that in the method we have used, the hearing of the stem is by air and not by bone conduction; otherwise, in these very cases the bone conduction ought to be increased just as it is when the stem is held against the mastoid process.

Objections might be raised to this method of testing air conduction, claiming that it is the wall of the tube or the hard rubber tip which transmits the sound waves of the cartilage or bone of the meatus and surrounding parts, just as when the rounded end of the fork stem is inserted directly into the meatus. It can, however, be demonstrated that sound waves are transmitted almost entirely through the column of air within the tube and not by the walls thereof. Molecular vibration, however, may be conducted by the tube wall, but the following experiments will show that no such vibrations were present in these tests and that what is heard is entirely by air conduction. When the tubing is clamped in a vise (a length of about 10 c.m. being compressed) the sound of the fork is not heard via tube lumen. If the fork is placed on the outside of the tube, the sound is heard if the fork rests between the vise and the ear, but if it is put on the farther side of the tubing—that is, beyond the vise—nothing is heard via tubing. If the rubber

tube is cut and the sections held in proximity but not in contact with one another, the sound of the fork is heard by way of the tube lumen; but when the section is clamped in a vise, there is no transmission of sound. When a steel tube is placed in the vise and the fork rests on it, the sound is transmitted, since the lumen, of course, is not compressed. If a steel rod 8 to 10 c.m. long is inserted into the end of the tube section, the sound of the fork is not heard by way of the lumen of the tube. That a little of the sound is transmitted through but not along the tube wall to the outside is shown by the fact that when the tubing or olive tip are held tightly against the auricle a faint sound only is heard. When thus held, however, and with the olive tip open the sound is heard, thus showing that the sound is transmitted to the ear through the open end and but slightly through the wall of the hard rubber olive tip. From the clinical standpoint we believe that the results obtained in a number of cases show definitely that the fork when used with tubing and tip in the ear is not heard by way of bone but only by way of air. In several cases of otosclerosis or some other middle ear involvement, where a prolongation of bone conduction, either relative or absolute, would be expected, we find, as previously noted, that with the tip in the ear the fork is heard a shorter time than were the prongs heard via air.

Although a search of the literature had been made, no reference to a modification of the Rinne test as done by Dr. Minton and myself was seen. But after reading the paper, an abstract of an article by Stefanini of Turin was found in the Italian Archives of Otology, etc., in which he calls attention to his method of testing both air and bone conduction by means of the fork stem. This is as follows:

"The handle of the fork is attached to a disc of wood, to the bottom of which are affixed two pieces of metal of equal length and 4 m.m. in diameter. To one of these is attached a rubber tube 1.4 meters long. The other metal strip is placed on the skull, and its vibrations are transmitted through the bone, while the rubber tubing is introduced into the ear, and the vibrations from that strip of metal are transmitted through the ear, the vibrations in both cases having the same source." We believe, however, that our method of merely using the tubing and an olive-shaped tip in the ear is a much simpler one although the principle involved is the same. Stefanini also believes that if the tragus is pushed into or across the meatus and the fork stem placed thereon, the sound is conducted by air. Thus he would naturally be testing air and bone conduction also with the stem; a very simple way indeed. Grade-

nigo thinks this holds true only in normal, not in pathological ears. We have tried out this method of Stefanini by placing the stem of the fork on the tragus, but we find several points of objection to this test. In the first place, the tragus is sometimes very short and rigid, and it is difficult or impossible to push it over and across the external auditory meatus. Unless the tragus does completely cover the entrance of the auditory canal it will not act as a membrane to transmit sounds by air, and its very thickness makes me doubt its efficiency as a vibrating membrane. It is difficult each time to get the same occlusion of the meatus by pressing in the tragus, whereas, this is much more easily done by the olive-shaped tip at the end of the tubing. Secondly, we found that with this technique, the air conduction seems very much longer than one would ordinarily believe. The Sonnenschein-Minton modification, however, appears to agree much better with the results found by the usual method in that the hearing via air conduction with the olive-shaped tip placed in the meatus, and the finding of the air conduction with the stem of the fork, agreed very well in its relation to the bone conduction with that found in the usual Rinne test. Even though Stefanini claims that placing the fork stem on the tragus gives hearing by air conduction only, we believe it is difficult to exclude the possibility of some of the sound waves being transmitted from the base of the tragus at its insertion through the bones of the skull to the ear, thus adding some bone conduction to that via air. By our method (as demonstrated above), it is quite certain that the sound waves are conducted along the lumen of the tube and the lumen of the olive-shaped, hard rubber tip by air conduction only, without appreciable additional bone conduction. For this reason we believe that the modification we have introduced is very accurate; and it is furthermore very simple in operation. The Stefanini test, however, has much to recommend it and should be tried out further.

CONCLUSIONS.

1. Physical experiments show that with the fork stem inserted in the end of a rubber tube the sound waves are transmitted to the ear by way of the air column in the lumen and not along the wall of the tubing.

2. Clinical findings show that with the fork stem in the tubing connected with the ear by way of the hard rubber olive tip, the sound is in many cases heard somewhat longer than with the prongs held near the ear. In most cases, however, of middle ear diseases, especially those with negative Rinne, the hearing by way of the tube was somewhat less than with the prongs, whereas, if the hearing had been by way of bone conduction, it should have been

increased with the tip in the ear. In general, however, the ratio between air and bone corresponds very well with that obtained in the usually performed Rinne test.

5. It seems therefore feasible to determine not only bone conduction as is usually done, but also the air conduction in the Rinne test, by means of the stem of the fork.

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29 East Madison Street.

THE ETHER TREATMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA.*

Dr. Thomas Hubbard, Toledo, Ohio.

One year ago, my associate, Dr. Evan G. Galbraith, made a clinical report on a method which had been used in our practice for more than four years in the treatment of chronic discharging ears. My object in presenting it at this time is to encourage a try out by clinicians in charge of institutional groups of cases and thereby to accumulate authoritative opinion and define the usefulness and limitations of ether as a solvent, cleansing antiseptic.

It is not necessary to go into the pathology of chronic ear suppuration nor the symptomatology since we are concerned only with the question of cleaning up a septic focus. It is highly desirable to develop a test treatment in this class of cases as an aid to a prompt decision of the question of indications for the radical operation.

Any local treatment must be aided by attention to general hygiene and by removal of foci of reinfection such as come from throat and nasal suppuration by way of the Eustachian tube and usual focal infection routes. Systemic diseases and in general anemia and malnutrition may be factors against possible cure—and it is all taken for granted that every possible aid to restoration of normal tone and resistance is given due consideration.

I will quote from Dr. Galbraith's report on his method: . . . "One might well ask when we are to know whether the mastoid is or is not involved. To such an inquiry we would answer that in many cases we do not know, but that our treatment will help us to settle the question. It may be stated as a postulate that unless there are signs or symptoms pointing to intra-cranial involvement no case of chronic aural suppuration should be subjected to a radical mastoid operation until local treatment has been given a thorough test. To put it another way, if after careful treatment for two or three weeks there is little or no sign of improvement in the condition we feel that we have a right to conclude that we are not dealing with a suppurative process that is limited to the middle ear, but that in all probability involves the mastoid as well. What we really want to say is that if the suppurative process is limited to the middle ear by this treatment we can expect a definite improvement or cure."

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"When a patient with a chronic ear presents himself for treatment the first thing to do is to take a careful medical history, special attention being given to the onset and subsequent course of the suppurative process and what measures have been taken to control it. This completed, he is then given a thorough general and ear, nose and throat examination, usually leaving the bad ear to the last. In most instances the external auditory canal will be found filled or partly filled with pus and foul smelling debris. This is best removed by syringing but once the ear is clean this is never repeated. A hearing test is now done to determine the degree of deafness in the affected ear. Should aural polypi be found they are removed by whatever method best suits the case. If any contributing causes, either general or local, are found they are corrected. If polypi have been removed, nothing further is done until the reaction incident to their removal has subsided. If none are present and all contributing causes have been taken care of, we are ready to proceed with the treatment.

"The patient is placed on his side with the affected ear up and the external auditory canal filled with ether, such as is used for anesthetic purposes. He is allowed to lie in this position until all the ether has evaporated and none runs out when he assumes the sitting position. This requires from ten to fifteen minutes, depending on the size of the canal. The ear is then examined again and whatever debris or discharge may be present is wiped away with cotton on an applicator. This is repeated daily a few times or twice a day if the discharge is profuse. The patient is then given a small bottle of ether and a dropper and directed how to clean the ear by using cotton on an applicator, following which he is to use the ether as described above once or twice a day as indicated. At stated intervals he is to report for inspection and a new supply of ether—with caution as to inflammable nature.

"Many favorable cases will show a marked improvement within a weeks' time. The odor will be less offensive and the discharge less profuse. Others will require a much longer time. In superior perforations with cholesteotomatous blocking, attic irrigation with ether may be necessary.

"After this treatment has been described there are two questions that are almost invariably asked. Is it safe? Is it painful? To the first, the reply is that it has been used over a period of four years and in all types of cases and no disturbing symptoms have developed; and in not one case has the pain been so severe that it was felt necessary to discontinue ether treatment. What pain there is, is of short duration and subsides long before the ether has entirely evaporated.

Even young patients submit after they have experienced the beneficial effects.

"When one considers the chemical and physical properties of ether he finds them to be such as to make it admirably suitable for getting at and clearing up a chronic suppurative process located in a more or less inaccessible place such as the middle ear. It is an active solvent of lipoids which are to be found in the debris of a chronic ear and by this action the discharge is converted to a thinner liquid, thus making its escape more easy. It boils at 95° F., which is just a few degrees below body temperature. This means that soon after it is poured into the external auditory canal its temperature is actually raised to its boiling point and a gentle boiling of the liquid can be seen taking place. This property, together with its solvent action, probably constitutes its chief value in the treatment of this condition. By its solvent action one can easily conceive of it gaining access to small crevices which could not be reached by syringing. Soon after it is instilled the heat of the body raises its temperature to the boiling point and the agitation resulting from the boiling process loosens and brings away particles that are preventing free drainage. That such a thing actually occurs can be seen by anyone who, on examining a canal that had been thoroughly cleansed before the instillation of the ether, will find it practically covered with small particles of debris after the ether has all evaporated.

"While it is probably of minor importance, ether has a definite germicidal action. It is known that it will kill the weaker organisms and it is not unlikely that its prolonged contact with the more resistant ones will render them less virulent. It is also highly probable that it has a stimulating effect upon the tissues with which it comes in contact, thus increasing their resistance to infection.

"The water content of ether is one-tenth of 1 per cent. This means that when the ether has all evaporated it leaves practically a dry cavity. This is highly desirable for it avoids waterlogging the already edematous mucous membranes."

In conclusion I would say that the ether treatment has been the routine in our office and in dispensary practice for now nearly five years and we have experienced satisfactory results to the extent that we recommend it unreservedly. A considerable group of cases who presented as candidates for the radical operation have been successfully treated by attention to the general conditions referred to, and the local ether method. In these borderline cases where one is in doubt as to the urgency of radical surgery this method aids in prompt decision. If there be no improvement after two or three weeks of

thorough treatment nor decided alleviation of such symptoms as purulent discharge, pain and odor, vertigo and general malaise, then it is time to advise the radical. The distinction between the curable and incurable is presented in a decisive manner.

The ether method is advocated in the post-operative treatment of the mastoid—that is, where it is indicated. An ear full of cold ether does cause vertigo as well as pain, but it quickly warms up to 95° F. and boils away. Granulations are checked and healing is promoted. Gauze packing is not necessary after a few dressings.

Ether has been used in general surgery of the bones. Osteo-myelitis with sinuses and sequestra respond favorably to ether flooding. One feature favorable to the use of this volatile solvent is that the water content is nil, germs and saprophytes of low viability are killed and bacteria are inhibited.

234 Michigan Street.

PAPILLARY CARCINOMA OF INFERIOR TURBINATE, SEPTUM AND ANTRUM.

Dr. Saul Knopf, New York.

Papillary carcinoma of nose and antrum is fairly uncommon, so that the report of a case may be of some interest.

Mrs. J. B., a robust female, came under my attention in Dr. Harmon Smith's Clinic on Mar. 2, 1924, complaining chiefly of nasal obstruction, catarrh, and unilateral headaches. Her family history and past history were irrelevant, although a few years ago a curettage was done for dysmenorrhea while she was in London. She was assured that there was no evidence of carcinoma in the endometrium. At any rate, her pelvic condition has never given her any evidence of trouble since.

Her present history dates back to five months prior to her admission, when she sought relief at some other institution for nasal catarrh, obstruction, and headaches. She was treated for these at interrupted intervals, when, about four weeks ago (Apr. 1), she noticed a small growth at the entrance of her left nostril. There was no history of any epistaxis, local pain, nor tenderness. No operation had previously been performed in this region.

Upon examination, a large papillomatous mass, pale pink in color and completely filling the left nostril, was found. This mass was

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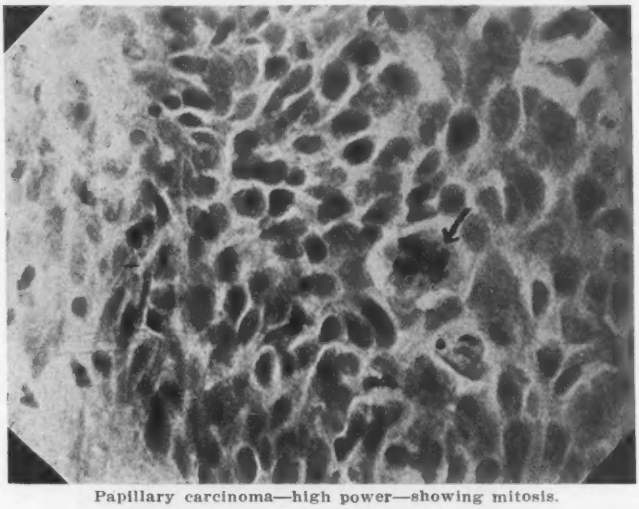
intimately connected with and proved to be a part of the left inferior turbinate, and apparently adherent at about 1½ c.m. distant from the vestibule to the septum, which was moderately congested. This tumor was covered with a muco-purulent secretion, was boggy to the touch, did not present any ulcerations and did not bleed by manipulation. Cocain and adrenalin had no effect upon its size. Posterior rhinoscopy revealed a smooth, moderately congested posterior tip on the left side, covered with a moderate amount of muco-pus. The right inferior turbinate was not enlarged and the septum was deviated to the right.

The tonsils were hypertrophied and apparently diseased. The teeth and gums were in fairly good condition; some of the upper



Papillary carcinoma—high power—showing mitosis.

teeth were missing. No enlarged cervical nor submaxillary glands were palpable, and no ocular disturbances were noted.

A tentative diagnosis of papilloma or condylomata was made.

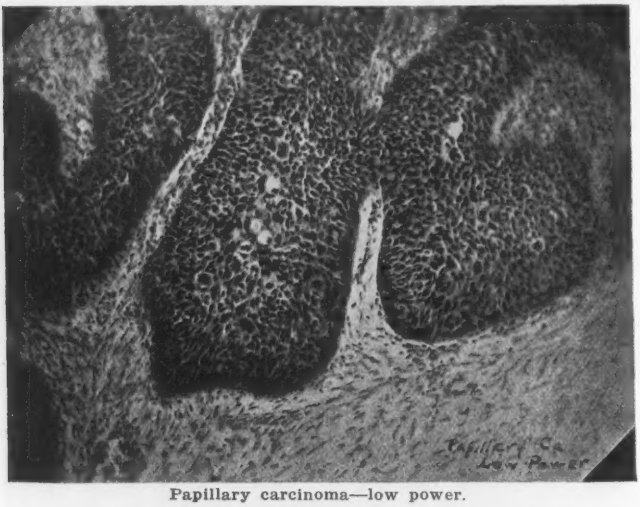
Under 10 per cent cocain, a section was removed for biopsy. A fairly large amount of bleeding followed, which, however, stopped spontaneously. The Wassermann test of both blood and spinal fluid was negative.

The report from the pathologist of the specimen was papilloma showing epitheliomatous change—"Papillary Carcinoma".

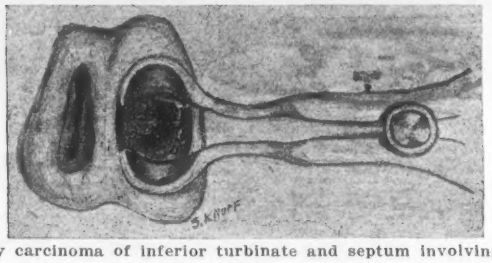
Immediately following this report, Mar. 11, Dr. Robinson applied 70 mgm. radium into the nose in the form of needles, for four-

teen hours, and on Mar. 12, by a block externally, 70 mgm., hoping that an endarteritis would occur, to permit operative procedure with a minimum possibility of metastasis.

The X-ray of her sinuses at this time showed an obstruction in the left nasal fossa and severe involvement of the left antrum with granulations or pus, moderately severe involvement of the left ethmoid, and moderate involvement of the left frontal. The right



Papillary carcinoma—low power.



Papillary carcinoma of inferior turbinate and septum involving antrum.

antrum, ethmoid and frontal were moderately involved. The sphenoids were clear.

Two weeks later, following consultation, it was decided to operate, remove the mass from the nose, and do a Caldwell-Luc upon the antrum, in view of the fact that the outlines of the bones on that side were distinct in outline.

During the operative procedure, after opening the antrum mucosa, apparently a distinct mucocele was found. The anterior and nasal wall of the antrum were completely removed, the mucosa thoroughly curetted from every corner, the inferior turbinate completely exenterated, and the wound packed.

Specimens of bone from the antrum were normal in appearance, both gross and microscopically. Specimens of tissue from the antrum showed papillary carcinoma, with chronic inflammatory tissue. Culture from the contents of the antrum contained a profuse growth of short chain hemolytic streptococcus pyogenes and staphylococcus albus.

Following the operation, a moderate reaction occurred, causing edema of the face and eyelid, which is still persisting. The after-treatment consisted of daily irrigations of the antrum with various solutions, and on Apr. 12 a tube of 50 mgm. radium was inserted into the nasal cavity for twenty hours, following which there was a moderate increase of edema of the face.

It is interesting to note the reaction of the radium upon the blood. Just before the application of radium, her blood sugar was 104 gms. per 10 c.c.; leucocytes, 8000, of which there were polys 68 per cent, small lymphocytes 14 per cent, and large lymphocytes 18 per cent. Following the radium, the blood sugar was 120 gms. per 100 c.c., leucocytes 12000, polys 70 per cent, small lymphocytes 27 per cent, large lymphocytes, 3 per cent.

Her condition today shows an edema of the face and eyelid. There is a fetid odor from the nose and upon examination we find a necrotic mass which appears to be her left middle turbinate, which is still firmly attached; a moderate, foul discharge from the nose, and a congestion and thickening of the septum. I expect to remove this necrotic mass as soon as it becomes sufficiently loose.

I am extremely anxious for suggestions as to further treatment of the nose and also for an opinion as to the prognosis. Another X-ray, made a few days ago, shows that the antrum and ethmoids are much clearer than when the former one was made.

SIMULATED MASTOIDITIS RELIEVED BY SPHENOIDECTOMY.*

DR. H. W. LYMAN, St. Louis, Mo.

Dr. H. I. Lillie[1], in 1922, reported three cases which had been diagnosed as mastoiditis, in which operation had either been advised, or performed without relief. In these cases the pain was relieved by cocainization of the nasal, spheno-palatine, or Meckel's ganglion. That observation added another to the long list of conditions which have been relieved by cocainization of this ganglion, and another type of otalgia to those commonly recognized as due to reflex irritations from the teeth, tonsils, larynx, etc.

This paper is a report of four cases of mastoidalgia in which the symptoms were so severe as to lead to operations on the mastoid without abating the pain, and in which cocainization of the nasal ganglion had no effect. These cases proved to be sphenoiditis and were relieved by opening the posterior para nasal sinuses.

Case 1. Male, age 30, chief complaint, severe pain and tenderness in the region of the left ear. Family history and general personal history negative.

He stated that in December, 1917, his ear was frozen. His record showed that he had been treated for a discharging left ear, his tonsils removed, etc. Whether the ear discharged before this time, or not, we were unable to determine. Since that time his left mastoid had been operated upon eight times without relief from the pain which he suffered. Examination showed a radical mastoid cavity which had not completely epidermized, and which was discharging a moderate amount of purulent secretion. The Eustachian tube orifice was patent; there were several areas of granulation, but no evidence of an acute exacerbation. Temperature normal, leucocyte count normal. Pressure in the region of the stapes caused marked vertigo. Patient had a spontaneous nystagmus on looking to the right and left. There was extreme tenderness above the external auditory meatus, in the region of the mastoid tip and behind the mastoid process.

Examination of the nose showed a septum moderately deflected to the left and an hypertrophied left middle turbinate which obstructed

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1. Journal American Medical Association, 79-431, August 5, 1922.

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the left naris. No pus was seen on posterior rhinoscopic examination. X-ray examination of the para nasal sinuses showed them to be apparently normal.

The appearance of the left mastoid did not show any adequate cause for the severe pain of which this patient complained. Patient had lost considerable weight, but careful examination of the chest, disclosed no evidences of tuberculosis. Cocainization of the nasal ganglion was tried without success. Treatment consisted of rest in bed, ice bag to the left mastoid, daily application of mercurochrome to the mastoid cavity.

There was a slow and gradual improvement in the condition of the ear. The nystagmus and vertigo cleared up; the discharge, which was chiefly due to the patent Eustachian tube, became less, but the patient continued to have frequent and severe attacks of pain and tenderness centering about the ear and radiating backward and downward.

The removal of the hypertrophied left middle turbinate was followed by the protrusion of a small polypus from the posterior ethmoid cells, and a positive diagnosis of posterior spheno-ethmoiditis was made.

In November, 1922, patient had attacks of so-called "stomach trouble" consisting of nausea and vomiting, some of them lasting as long as thirty minutes. Examination disclosed no condition in the gastro-intestinal tract which could be considered responsible, and we believed they were due to toxic irritations of the labyrinth.

In December, 1922, there was an intercurrent attack of acute otitis media on the right side, which, however, cleared up promptly after paracentesis.

On January 8, 1923, a complete spheno-ethmoid exenteration was performed on the left side with marked relief of his so-called mastoid symptoms. The posterior ethmoid cells and the sphenoid were found packed with a polypoid mass, which was removed as thoroughly as possible and treated thereafter by various local applications such as phenol in oil, mercurochrome, etc.

Subsequent to the spheno-ethmoid operation his condition showed gradual improvement, with the interesting feature that his attacks of pain and tenderness in the mastoid area, were coincident with "flare ups" of his sinus condition, the ear showing no corresponding change whatever. On February 5, he complained of pain in the posterior-inferior triangle of the neck on turning his head to the right or left. Cocainization of the spheno-palatine ganglion relieved this pain.

In August, 1923, the mastoid wound, which had discharged continuously, was laid open in an attempt to obtain a dry ear and also to see whether any pathological condition could be discovered in this region. The incision was made about an inch behind the auricle to avoid the previous scars. Nothing of moment was discovered except that the posterior wall of the bony cavity was rough and was secreting a muco-purulent fluid. The cavity was curetted rather carefully, the orifice of the Eustachian tube cleaned out, the region of the root of the zygoma, where the patient had complained of marked tenderness, was explored, but no gross pathology was found. The slight amount of cancellous tissue remaining in the mastoid tip was removed: Behind the mastoid process and below the lateral sinus, two small cells were encountered which seemed to be moist, although this was not certain. The wound was closed with through and through silkworm gut sutures and dressed. Eventually epidermization of the entire cavity, with closure of the Eustachian tube was obtained, resulting in a dry ear, but nothing was found at the time of the operation which would account for the suffering he had undergone.

There was from the beginning in this case a marked psychoneurotic element, as is often encountered in ex-service men who have become thoroughly hospitalized, and it was difficult to determine whether his sufferings were as severe as they seemed. Careful neurological examination disclosed no abnormalities nor any suggestion of central nervous system disturbance. Believing that a warm and equable climate would be beneficial to the sinus condition, he was, on our recommendation, transferred to southern California, and, at last report, was getting along very nicely.

The most striking points in this case were the number of times the mastoid had been operated on without relief, and the recurrence of the so-called mastoid symptoms of pain and tenderness with any relapse of the sinus infection.

Case II and III. Male, admitted April 24, 1923, complaining of intense pain in the region of the right mastoid, vertigo and nausea. Patient stated that he first had ear trouble in December, 1917, starting with a purulent discharge from the right ear, and that the ear had troubled him ever since.

Examination showed a perforated drum head, but a perfectly dry ear with no evidence of inflammatory condition. The entire mastoid area was exquisitely sensitive to pressure, this tenderness extending backward beyond the area of the mastoid process. The pain also radiated upward over the ear. An X-ray of the mastoid

showed the characteristic eburnation of the bone seen in chronic mastoiditis. Whether the beginning of this trouble was in December, 1917, or previous to that, it was impossible to determine, but there was no evidence of an acute exacerbation at the present time. Examination failed to show any change in the ear condition.

The patient had entered the hospital for a radical mastoid, and continually requested it. Repeated examination of the nose failed to disclose any evidence of a suppurative spheno-ethmoid condition. No hyperplasia could be detected, and repeated examinations failed to show any discharge from this region. However, as these examinations were, of necessity, made without the arc light, it is quite possible that insufficient illumination may have been the cause of this failure. Cocainization of the nasal ganglion did not give any definite relief from the retro-mastoid pain. However, probing in the sphenoid sinus caused the characteristic pain of which the patient had complained.

The conclusion of a special neurological examination was as follows: "We find no evidence of organic disease of the nervous system. There is, however, evidence of a functional disturbance of an hysterical type that should be seriously considered in the analysis of the case, from the standpoint of operative procedure."

In the absence of any indication for operation on the mastoid, and in view of our ability to bring on the attacks by means of probing in the sphenoid, it was deemed advisable to open the sphenoethmoid cells on this side, which was accordingly done, August 13, 1923, under twilight anesthesia. This was followed by considerable improvement in the mastoid symptoms.

The patient had several relapses, and on November 26, complained of distinctly more severe pain in the right mastoid, and, for the first time, of some pain in the left mastoid region and behind it. Examination of both ears at this time was negative. The right posterior sinuses were quite inflamed and the sphenoid cavity was filled with swollen tissue. The posterior end of the left middle turbinate showed a small area of thickening at its point of attachment to the nasal wall.

On November 28, because of the severity of the symptoms, an exploratory mastoid operation was performed on the right side. The bone was sclerosed, as in the usual chronic mastoid case, but no granulation tissue, pus, or any evidence of acute inflammation was found. The wound was closed and healed without any special features.

In January, 1924, patient began to complain more frequently of pain and tenderness behind the left mastoid, with negative findings.

With the patient's willing consent, the left spheno-ethmoid cells were exenterated and a polypoid degeneration was found within them. This case also showed exacerbations of the retro-mastoid pain (unrelieved by cocainization of the nasal ganglion) corresponding with "flare ups" of the sinus infection. These "flare ups" however, are becoming less frequent and less severe. Repeated removal of the polypoid tissue has been done and local treatment kept up faithfully. At present we are using heavy doses of X-ray in an effort to destroy the polypoid structures and prevent their recurrence.

Patient's physical and nervous condition are infinitely better than they were before the sphenoidectomy.

Case IV. Male, aged 23.

While on a train, going to Fort Leavenworth, the patient was thrown forward and his right mastoid struck the arm of the chair seat. He was in the hosiptal for some time. The pain over the mastoid area continued. He was transferred to Camp Meade, where he was in the hospital several times for examinations of ear and mastoid condition, then transferred to Fort Logan and discharged. Within one month after discharge, he began to have so-called "epileptic attacks". He was in hospital No. 35 for six months. The so-called "epileptic attacks" proved to be hysterical in nature, no cause for operation on the mastoid could be found, and the patient was discharged. Some time after his discharge, a mastoid operation was attempted, but, acording to the patient's report, was not completed because of excessive bleeding at the time of the operation. He had none of the so-called "epileptic attacks" for several months following this. After six months he began again to have light attacks of so-called "epilepsy". Some time after this a second mastoid operation was attempted and this also was discontinued because of bleeding.

His chief complaint, on re-entering the hospital, was severe pain and tenderness in the right mastoid region extending backward and upward, and attacks of vertigo. Examination showed the mastoid wound to be healed except for a little granulation tissue at the lower extremity of the incision. The patient stated that as long as the wound had discharged he felt very well, following both of these operations, but when the wound closed, his pain returned. The right drumhead was thickened, but there was no evidence of inflammation or discharge in the ear. A portion of the posterior bony canal wall appeared to have been removed, but the drumhead was still intact.

The neurological report was summed up as follows:

"A perusal of the patient's previous hospital record shows observation of this man having had as many as sixty fits a day with a period of unconsciousness for twenty-four hours. The nature and length of these seizures, the reactions of the patient, together with his history since his discharge from the hospital prove unquestionably that they were of an hysterical nature. * * * There is no doubt in our minds that he is a major hysteric, and we feel that great caution should be used before any more operative procedures are undertaken on this patient.

The neurotic element in this case was far more pronounced than in either of the other two, the man being confined to his bed, trembling violently and bursting into tears at any examination. The patient begged for another attempt to complete the mastoid operation, regardless of the outcome, as he said he would rather be dead than to be suffering the way he was. In the absence of any indications of mastoid inflammation, a careful investigation of the nose was made. Cocainization of the nasal ganglion did not afford any relief. There was hyperplasia of the posterior end of the right middle turbinate and of the plica septi on the right side. Our experience with the other cases here reported was explained to this patient and every effort to obtain his consent for a spheno-ethmoidectomy. After many weeks, the best that could be obtained was consent to the sphenoid operation, provided that an attempt to complete the mastoid operation, also be made. As it was impossible to get the patient's unqualified consent, and, as the exploration of the mastoid might prove very instructive, this condition was agreed to. On opening the sphenoid and ethmoid cells, they were found to be packed with polypoid material which was cleaned out. The mastoid was then opened. The incision was placed behind the previous incisions and a rather large anterior flap turned up from the bone. A small depression was found over the mastoid cells. As soon as chiseling began, very profuse bleeding from the bone occured. However, this bleeding was controlled by the use of bone wax, and the operation continued. The cerebellum and lateral sinus came very far forward. In fact, no cancellous tissue could be detected between the posterior bony canal wall and the inner table of the skull. In order to reach the antrum it was necessary to approach the cavity from beneath the tip of the tempro-sphenoidal lobe. When the antrum was reached, no gross pathology could be detected. The cells in the tip of the mastoid process were exenterated and the wound closed. Healing took place uneventfully.

The phychic change, as well as the physical improvement in this man was very striking after the operation. From being despondent, weepy, and generally hysterical, he became animated, mentally alert, and hopeful of recovery. His improvement has gone on more or less steadily since the operation, with relapses from time to time. Of course, from a scientific point of view, this case may be a questionable example of the type of simulated mastoiditis under discussion, because of the fact that both his sphenoid and mastoid were operated on at the same time, but, in view of the definite pathology found in the nose and the absence of any pathological condition in the mastoid, the writer believes that this case is similar to the others reported.

The first case may have had a suppurative mastoiditis in 1917, but, undoubtedly, some of the subsequent operations in the mastoid region were performed for the relief of pain which had its origin in the sphenoid sinus. The second case is especially interesting because, although the right side was complicated by the presence of a healed, chronic mastoiditis, the pain was relieved by sphenoidectomy. Similar symptoms developed in the left side, with an absolutely normal ear, while the case was under our observation, and relief was obtained by sphenoidectomy.

The salient features of these cases were:

1. The marked psycho-neurotic element in each case. Clinically, the pain and suffering described by the patients was out of all proportion to any possible cause in the mastoid region, and these symptoms had continued over a period of years without developing any gross pathology.

2. In each of these cases, while the tenderness was very marked over a large area, there was a point of extreme sensitiveness a short distance behind the mastoid process. This tender point is quite constant in nasal ganglion headaches.

3. Operations on the mastoid had failed to relieve the pain.

4. Cocainization of the nasal ganglion afforded practically no relief.

5. Opening the sphenoid and ethmoid sinuses resulted in marked amelioration of the mastoid symptoms.

The anatomy of the nasal ganglion affords a plausible explanation of these cases.

Time will not permit a detailed description of this structure, but, Dr. Greenfield Sluder, in Chapter 2 of "Headaches and Eye Disorders of Nasal Origin" calls attention to the fact that the so-called nasal ganglion syndrome may be produced by lesions of the nerve

trunks which supply the ganglion, namely, the maxillary and vidian nerves, which frequently lie in very close proximity to the sphenoid sinus, and that when inflammation exists in the sphenoid cavity, it may readily involve these nerve trunks, either by extension or toxic irritation, and simulate the syndrome arising from irritation of the ganglion itself.

The writer believes that this point was repeatedly demonstrated in these cases by the fact that an exacerbation of the sphenoiditis caused a return of the so-called mastoid sypmtoms.

As the pain in these cases was posterior in its distribution, the regions supplied by the maxillary nerve being unaffected, it would appear that only the vidian nerve trunk was involved, and that they were cases of vidian neuralgia.

BONE FRAGMENT IN TRACHEA WITH MARKED SUBGLOTTIC EDEMA.

DR. M. P. STILES, Birmingham, Ala.

M. C., female, age 1 year, was referred by Dr. H. P. Shugerman, of this city, with the following history: Three days ago began to cough, appeared to have a severe cold, and had some fever. Cough continued with occasional paroxysms until about eighteen hours ago. Since then, has coughed much less, but has had noticeable difficulty in breathing, which symptom has been steadily growing worse. Upon questioning, the parents recalled that the night before onset of illness, while dining in a local cafe, they gave the baby some juice from a chicken stew on a piece of bread. While eating this, she coughed and choked once, but had no further symptoms at the time.

Upon admission to the hospital, temperature was 101°, pulse 120, respiration 50. Breathing was rapid and difficult, with indrawing of supraclavicular, intercostal and epigastric spaces. There was moderate cyanosis. Examination of nose and throat was negative. There was a faint asthmatoid wheeze heard at mouth on expiration. Lungs were negative except for a few scattered rales. X-ray examination was negative.

Without anesthesia, the Jackson laryngeal speculum was introduced, and just below the vocal cords, the tracheal lumen appeared

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to be almost obliterated by a ring of swollen and somewhat excoriated mucosa. Lying fixed in this edematous area was seen a thin, flat fragment of chicken bone, 6 x 3 m.m. in size. It was gently removed through the glottis with alligator forceps, and a moderate amount of bronchial secretion was removed by aspiration. An ice bag was then applied to the neck.

Following removal of the foreign body, the breathing became somewhat less difficult, but remained considerably obstructed. The patient was watched constantly for several hours, and as the dyspnea showed no disposition to diminish further, and as the heart was beginning to show the effect of the strain, a low tracheotomy was performed with novocain anesthesia, and a No. 1 Jackson tube inserted. This immediately relieved the dyspnea, and the baby's genral condition promptly improved. After ten days the edema had subsided sufficiently to permit removal of the tube, following which, recovery was uneventful, and the patient has had no symptoms of respiratory obstruction since.

Without doubt, when this foreign body was first inspired, it was freely movable in the trachea, irritating the mucosa as it rose and fell with respiration, causing paroxysms of coughing, but producing very little obstruction itself. This irritation gave rise to the subglottic edema which in turn was responsible for the dyspnea. An earlier endoscopy would have forestalled this complication, and rendered the tracheotomy unnecessary.

Of medico-legal interest may be mentioned the fact that this case formed the basis of a suit against the cafe in which the foreign body was inspired. A verdict was rendered in favor of the defendant, presumably upon the theory that the food was served to the parents, who gave some of it to the baby upon their own responsibility, and that chicken stew for adult consumption properly contains bones. As a matter of fact, such accidents are largely due to the prevalent custom in preparing food of this kind, of hurriedly chopping the fowl to pieces with a butcher's cleaver, which splinters the bones, instead of carefully disjointing it with a knife.

Acknowledgement is due Dr. Shugerman, who made the diagnosis in this case, and whose medical care contributed largely to its successful outcome.

CORRECTION OF NASAL DEFORMITIES FOLLOWING SEPTUM OPERATIONS.

Dr. Joseph Safian, New York.

There is a lamentable tendency on the part of many nose and throat surgeons to resect every septum that shows even the slightest deviation from the normal. While it is true that a large number of persons suffer from obstructed breathing, the septum is not always at fault, even though it is slightly deflected from the central line. Chronic catarrhal conditions due to infected sinuses, as well as the large class of cases with mucosae hypersensitive to foreign proteins, or climatic changes, eventually develop into chronic thickening of the mucosa which is the cause of obstruction to free passage of air.

Assuming that a badly deviated septum is the sole cause of obstruction in a given case, it is the duty of the surgeon to decide on the type of operation that will give the greatest amount of breathing space, with the least sacrifice of septal structure. Too often a stereotyped operation is performed which has in view the removal of as much bone and cartilage as can possibly be reached. I have often seen patients whose entire cartilaginous septum had been removed, and there was left behind a thick bony ridge along the floor of the nose which came in contact with the inferior turbinate on one side, and constituted the actual obstruction. In such a case, the resection of the septal cartilage will produce more harm than good because the obstruction is still present and the patient is in danger of developing a saddle of the cartilaginous lower half of the nose, or decided sinking of the tip of the nose.

One of the commonest deformities of the nose following septum resection is saddle nose. It is surprising how many patients develop this deformity following unnecessary or faulty nasal operations, and without relief of the nasal obstruction.

Many rhinologists are under the impression that as long as they allow a narrow strip of cartilage to remain along the dorsum of the nose, no saddle can develop. This is not always true, because even the slightest blow on the nose will fracture the thin supporting strip and will produce a sinking in at the dorsum or a deviation of the tip of the nose.

It is difficult to understand why some rhinologists persist in starting a resection at the lower border of the septal cartilage. In these cases there is always present the possibility of a sinking of the tip of the nose and there is almost always a drawing upward

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of the columella due to scar contraction. I have seen this deformity develop to such a degree, that the tip of the nose almost came in contact with the upper lip and in itself constituted a serious obstruction to respiration, aside from the poor cosmetic effect. Fig. 1 shows such a patient. He found that the only relief he could obtain was to support the tip of the nose with his finger. The correction in this case consisted in raising the tip by shortening of the nose, although it always proves a difficult matter in a patient whose septum has been removed, as there is hardly any support for the tip even after the shortening.

The saddle type of deformity, following septum resection is illustrated in Figs. 3 and 5. It can be readily seen that this type of deformity imparts to the face an unpleasant appearance and at times gives a suspicion of lues. The young lady in Fig. 3 had a

Fig. 1

Fig .2

perfect profile before her septum was resected; her appearance after the operation changed to such a degree that she was obliged to give up her career on the stage. Fig. 4 shows the same patient after correction of the deformity. The pugnacious appearance of Mr. S. in Fig. 5 belies his peaceable nature and is only the result of a septum resection. Fig. 6 shows the same patient after the correction.

This paper deals only with the correction of the deformities described. In another article I will discuss a new operation for the correction of deviated septum which almost entirely obviates the possibility of such deformities. Many substances have been used to correct a saddle nose with fairly good results. The use of paraffin injections is mentioned only to be condemned on account of the formation of parrafinoma. The use of rib cartilage or a strip of cartilage from behind the ear is most commonly employed, but it has the disadvantage that it cannot be shaped to fit the

deformity, especially if it is of slight degree. Furthermore, cartilage has a tendency to curl up at the edges and may for that reason form irregularities along the dorsum of the nose. The method I have employed in a large number of cases has given uniformly good results.

The use of ivory as transplant material was first used by Gluck of Paris to bridge fractures of the long bones. Joseph of Berlin first used it for the correction of saddle nose of traumatic or luetic origin. In a large series of his cases which I observed, the ivory transplant remained in position for a number of years without producing any reaction in the tissues. I employ a small ivory transplant to correct the depressions in the cartilaginous portion of the nose which follow resection of the septum.

Fig. 3

Fig. 4

An important factor in this operation is the proper shaping of the ivory transplant which requires considerable skill and a great deal of patience. Great care must be observed that the transplant fits perfectly into the depression and is free of sharp edges. The operation is performed in the following manner: An incision is made along the lower border of the left triangular cartilage, the scalpel is pushed upward over the nasal bones and the skin over the depression and for a considerable distance around it is undermined.

A very important detail is the separation of the skin over both alar cartilages almost down to the very tip of the nose. This can be accomplished only by the use of a special scalpel designed by Trelat which permits the formation of a pocket for the reception of the transplant. A flat guide is then introduced into the incision, the transplant seized with a bone forceps and slid along the guide into the pocket. The incision is then closed with two or three silk sutures. A light gauze packing is introduced into the left nostril

and an adhesive strip applied across the dorsum of the nose. The undermined skin attaches itself to the underlying tissues all around the transplant so that the piece of ivory is surrounded by a tough fibrous tissue capsule and cannot be displaced. If the transplant has been properly shaped, the patient regains a perfect contour of the nose. Before introducing the transplant, it is sterilized by boiling for half an hour.

The correction of a drooping tip of the nose following the removal of the lower border of the septal cartilage is a difficult condition to overcome. A method commonly employed is the transplantation of cartilage or bone into the columella to help support the tip. Patients as a rule object to having a portion of rib or tibia resected for the correction of so slight a deformity, although they suffer great mental anguish through their changed appearance. For

Fig. 5

Fig. 6

that reason I never suggest to a patient what seems to them a major operation for the correction of a minor deformity. The nose as a rule is long enough to permit of considerable shortening. By undermining the skin over the entire nose and resecting a section of the mucosal bridge which remains between the shortened septum and the columella, the tip can be raised so that it almost rests upon the shortened cartilaginous septum, thus regaining some of the support which it has lost. The result is a somewhat shorter nose with a tip that is firmly supported by cartilage.

The correction of septal perforations has always been the bugbear of rhinologists. It is surprising how many of these patients present themselves to plastic surgeons for the correction of the defect. Unfortunately very little can be done in the way of correction unless the damage is small. In such cases the method devised by Halle of Berlin gives the best results.

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A CONSIDERATION OF WHAT MAY BE ACCOMPLISHED THROUGH THE NASAL (SPHENOPALATINE, MECKEL'S) GANGLION IN THE DIAGNOSIS AND TREATMENT OF CERTAIN NASAL CONDITIONS.*

Dr. Arthur M. Alden, St. Louis.

Prior to 1908, the nasal (sphenopalatine) ganglion was of interest only to the anatomist. In that year Sluder[1] published the observation that certain types of headache were probably caused by irritative processes in the nose which affected this ganglion. Since that time reports of many other investigations have appeared which have shown that lesions which involve the nasal ganglion or its nervous tributaries may be productive not only of pain but many other neurological phenomena; *e. g.*, motor, sensory, respiratory and vasomotor. Previous to the publication of these researches our knowledge of the physiological mechanism involved in the nervous control of this region was practically nil. However, at the present time our information on this subject, while it still leaves much to be desired, has been greatly augmented by the correlated observations of several writers. We do know that by experimental irritation of this nerve center we can produce many of the symptoms of which our patients complain and it has also been repeatedly demonstrated that not a few of these symptoms may be controlled or entirely relieved by appropriate medication directed to the nasal ganglion. We have come to appreciate the fact that this center through which pass the majority of the afferent and efferent nervous impulses affecting the nasal mucosa is an important factor in the recognition and treatment of nasal disturbances.

The nasal ganglion (ganglion of Meckel) is situated in the sphenomaxillary fossa in front of the anterior opening of the Vidian canal, close to the sphenopalatine foramen. It is triangular in form, with its apex pointing backward in the direction of the Vidian canal. Its outer surface is convex, and averages about 8 mm. in diameter. It is reddish-gray in color, except at its broadest part, where it is composed entirely of gray matter.

The branches or roots of communication of the sphenopalatine ganglion are:

1. *The sensory roots,* two in number, which arise from the maxillary nerve as it passes through the sphenomaxillary fossa. They

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enter the ganglion separately, one at the anterior and the other at the posterior corner of the upper surface. Some of the fibers of these roots pass through the ganglion without becoming incorporated with it, and form the palatine nerves.

2. *The motor root,* which is quite long, arises from the facial nerve or the great superficial petrosal nerve at the geniculate ganglion within the prominence of the facial canal. This root is joined by the sympathetic root or the great deep petrosal nerve from the carotid plexus and the two conjointly are called the nerve of the pterygoid canal (Vidian nerve).

The branches of distribution from the nasal ganglion may be conveniently grouped into four divisions:

1. *Orbital branches,* consisting of three or four fine filaments which pass into the orbit through the inferior orbital fissure, and are distributed to the periosteum and mucous membrane of the posterior ethmoidal and sphenoidal sinuses by passing between the sphenoid and ethmoid bones.

Some of the branches which pass upward are distributed to the neurilemma of the optic nerve (Arnold and Longet)[2].

A branch from the ganglion ascends to the sixth nerve (Bock and Valentin)[3].

There is also a branch to the ciliary ganglion (Tiedemann)[4].

Two or three branches, spheno-ethmoidal, ascend to the superior portion of the internal orbital wall, pass through the posterior ethmoidal foramen, and enter the brain-case (Luschka)[5].

2. *The descending or palatine branches* are three in number—anterior, posterior and external. These three branches pass from the maxillary nerve through that portion of the ganglion in which there is little ganglionic or gray matter. They are distributed to the mucosa of the upper and lower surfaces of both the hard and soft palate, gums and lateral pharyngeal wall.

3. *The internal or nasal branches* consist of two divisions, upper nasal and nasopalatine. The branches of these nerves are distributed to the entire lateral wall of the nose except the inferior meatus which receives a few filaments from the descending palatine nerve. Branches of this nerve also pass to the posterior-superior part of the septum.

4. The posterior branch also known as the pterygopalatine nerve supplies the lateral wall of the nasopharynx in the region of Rosenmueller's fossa.

From the foregoing description it will be seen that the ganglion by its tributaries is in intimate sensory and sympathetic relation with all the mucosa in the nasopharynx and nose, excepting a portion

of the inferior meatus, and the gums and oral mucosa covering the hard and soft palate. Moreover, the ganglion by its anatomical position is a structure contiguous to the posterior group of paranasal cells. It is separated from the sphenoidal cell, the posterior ethmoidal cells and the maxillary antrum by only a paper-thin wall of bone and in the lateral wall of the nose its covering is often only the thickness of the overlying nasal mucosa.

The recognition of the superficial anatomical position occupied by the nasal ganglion paved the way for Sluder's two original conclusions regarding this structure—first, that being in such close connection with the posterior group of paranasal cells and the mucosa of the lateral wall, it may be affected by irritative pathological processes of these structures, and; second, by its exposed condition it should be susceptible to medication from the outside (intranasal). Upon these two fundamental conceptions all the work on the ganglion has been based and clinical experience has repeatedly demonstrated the validity of Sluder's original conclusions.

If, then, this nerve center through which pass the majority of sensory impulses arising in the nasal mucosa lies so close to the surface it should be possible to abolish these impulses by block anesthesia applied to the ganglion. This can be done. The application of a small pledget of cotton saturated with one or two drops of a strong solution of cocaine (20 per cent to 90 per cent) to the mucosa covering the sphenopalatine foramen for a few minutes completely inhibits all sensory impulses arising in the area of distribution of the ganglion nerve branches.

This phenomenon has two applications. First, a perfect block anesthesia for the entire posterior lateral wall of the nose sufficient for all surgical purposes may be obtained by this procedure. However, where surgical intervention is contemplated on the anterior group of cells, blocking of the anterior ethmoidal nerve in the same manner is necessary for complete anesthesia in this portion of the nose. Second, where irritative impulses arising from pathology in the mucosa somewhere in the area of the sensory or sympathetic distribution of the ganglion are causing reflex symptoms through the ganglion, *i. e.*, headache, rhinorrhea, sneezing, these symptoms may be almost instantly alleviated by cocainization of the ganglion. This effect is so prompt that it is often spectacular. To have a patient sit in your chair with a headache that is so severe as to entirely incapacitate him from any form of endeavor and after a ten minute application to the ganglion be completely relieved is to say the least remarkable. The patient often can hardly believe that the pain is all gone in so short a time and will shake his head vigorously as

though to see if any pain remains. The relief from this form of treatment is, of course, not permanent as long as the original lesion producing the irritation is present, but it often lasts for several days, at least allowing time to treat the primary cause.

Case 1: Mrs. J. S., age 54. The patient came to me complaining of recurrent attacks of headache. This headache was parietal and occipital and as a rule involved the muscles of the neck. She says that it is sometimes on one side and sometimes on the other and on several occasions has been bilateral. She has had these headaches for many years and her mother had them before her. There is usually considerable prostration with the attack which lasts as a rule all day and several times has lasted into the second day. Physiologic doses of opiates have been the only medicines that have given relief.

Cocainization of the nasal ganglion has given immediate relief on six occasions. The patient prefers this treatment to having her ganglia injected.

The above statement is not to be construed as offering this as a panacea for all headaches. The type of headache to which this treatment is applicable is a fairly well defined pain syndrome and has been carefully described by Sluder in his book on "Headaches and Eye Disorders of Nasal Origin". This is the typical pain so often associated with hyperplastic spheno-ethmoiditis. By cocainization of the ganglion, headaches of this type may be differentiated from those arising from suppurative or hyperplastic lesions within the sphenoid cell, for in the latter type the pain is the result of irritation which is central to the ganglion, that is to the maxillary and Vidian nerves, and does not respond to treatment directed to the ganglion.

The sympathetic syndrome, evidenced by profuse rhinorrhea, lacrimation and sneezing with extreme turgescence of the nasal mucosa which is in all probability only a form of that condition which we have called hyperaesthetic rhinitis, responds to this treatment with promptness equal to that of the pain syndrome. The most popular conception of the etiology of this symptom complex is that it is the result of irritation to the nerve endings in the nasal mucosa by some foreign protein, usually inspired, as a pollen or animal emanation, to which the individual had been previously sensitized. Payne[6] has recently made a very important contribution to the therapy of hay fever. Believing that hay fever might be controlled by medication to the ganglion, he injected both ganglia of forty-three cases of hay fever, all during the attack. The results varied from an amelioration, such as to cause the patient to suffer but little

discomfort, to complete relief. In only three cases was the failure to produce relief complete. Compared with the success of any other therapeutic measures for the relief of this distressing malady these results speak for themselves. These results are difficult to explain; and until we more fully understand the many phases of this question any explanation must be entirely hypothetical. We do know, however, that only certain individuals are affected and most of those who are susceptible to hay fever show deviations from the normal in their post-ethmoidal sphenoidal mucosa. Based upon our knowledge that practically all afferent impulses arising in the nasal mucosa must pass through the ganglion, may it not be possible that in certain individuals a lesion affecting the ganglion has lowered the threshold for irritation of these afferent fibers below the normal, thus making them hypersensitive? This question cannot be answered at the present time.

Case 2: Miss E. H., age 28, typist. Referred to me on account of sneezing and hydrorrhea. The patient says that for several years she has had recurrent attacks of sneezing followed by profuse nasal discharge. She thinks that this condition began with influenza in 1918. The attacks are not seasonal or periodic and may come on without warning at any time or day. The condition usually begins with a spasm of uncontrollable sneezing which may last for a few minutes or be prolonged for two hours. This is followed by a profuse watery secretion from the nose that requires the use of a towel instead of a handkerchief and greatly interferes with her vocation. Lately she has had about one or two attacks a week. Several months ago she was tested and found sensitive to several proteins but vaccines for these substances gave her no relief.

When seen in the midst of an exacerbation of the disease a ten minute application of a 2 mm. of 75 per cent cocain to each nasal ganglion entirely stopped the symptoms. This procedure was repeated on four separate occasions with similar results. Each ganglion was then injected with 5 per cent phenol in 95 per cent alcohol. This was done more than seven months ago and up to the present time the patient has been entirely free of her symptoms.

Every rhinologist has seen cases of bronchial asthma which were apparently due to nasal irritation. While the clinical manifestations of this condition are remote from the nose, the exciting cause or stimulus which sets off the attack usually comes in by way of the nasal mucosa. These unfortunate individuals when subjected to a careful examination of the upper air passages all show pathology or perverted physiology in the nose which is usually due to some form of mechanical obstruction. The sensory impulse which is the ex-

citing cause of the attack must come in through the ganglion. Here again we have the question of personal susceptibility or personal hyper-irritability to certain stimuli. This may be explained on the same grounds as that of hay fever, namely, lowered threshold for irritability due to pathological changes affecting the ganglion. The fact that many cases of asthma have been suddenly stopped by cocainization of the ganglion *may* be explained on the ground that the impulse which sets off the attack and which arises distal to the ganglion is followed by a succession of other impulses which keep the attack going. Blocking these impulses as they pass through the ganglion stop the stimuli, and the attack ceases. The exact nerve path by which these impulses travel from the nose to cardio-accelerator and pulmonary vaso-motor centers is unknown unless we may ascribe certain functions to the sympathetic nervous system hitherto denied, namely that of conveying afferent impulses.

Ewing[7], in 1908, reported the fact that the pain of acute glaucoma could be relieved by cocain applied to the nasal ganglion. Since that time other observers, Green[8], Bryan[9], Miller[10], have reported other types of occular pain which were definitely alleviated by ganglion medication.

Earache, or pain referred to the region of the ear, is often a part of the ganglion pain syndrome. As a result of the relief by ganglion medication of the ear pain when associated with this symptom complex, Sluder[11] and others tried the same treatment for various other types of ear pain with many successes. This has now passed the experimental stage in the Ear, Nose and Throat Clinic at Washington University Medical School and it has been definitely demonstrated that the pain of an acute middle ear disease or acute Eustacheitis can be relieved by this procedure (Clerf)[12]. The pain of otitis externa and mastoiditis is seemingly outside the control of the ganglion.

Case 3. Miss H. B., teacher. Two days after adenoidectomy, which was finished by massage of each fossa of Rosenmueller with the index finger covered with gauze, patient complained of most excruciating earache on right side. The eardrum when examined was found normal except for slight retraction. Cocainization of the right nasal ganglion entirely relieved the pain. Twelve hours later the pain returned and was again stopped at once by the same treatment. It was necessary to repeat this procedure four times for permanent relief. No other medication was given.

The results of this work, particularly on the control of pain in various parts of the head, have been that this procedure has been tried for the relief of almost every pain which a patient may have

anywhere in the upper extremity and some curious facts have developed. Dean[13] reports the fact that the stubborn pain of glossodynia may be controlled through the ganglion. Since then others have reported that external cricodynia, mandibular pain and toothache may be also controlled in the same manner. Dr. Bruno Goldschmidt-Osmund[14] makes the categorical statement that all syphilitic headache is controllable by cocainization of the ganglion district.

As will be seen from the foregoing statements, most of our information regarding these phenomena has been obtained as the result of experimental treatment. Many of these facts lack an adequate anatomical basis for their explanation. This is probably due to the fact that at the present time the function of the involuntary nervous system and its intimate interganglionic connections is but poorly understood. Doubtless when the physiologist can tell us more fully of the function of this very interesting accessory to the central nervous system the explanation of many of these seemingly unexplainable phenomena will be made clear. At the present time we only know that they do exist and that in many cases they may be of the greatest assistance in relieving our patients of distressing symptoms. much information may be obtained as the result of experiment; and the limitations of this therapy and the final answer to many of these seemingly unrelated phenomena will come only as the product of the correlation of the recorded findings of many unprejudiced observers.

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THE ACCESSORY SINUSES. AN ARGUMENT FOR CONSERVATIVE TREATMENT, BASED ON ANATOMICAL FACTS.

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The purpose of this paper is not to condemn good surgical judgment as applied to the nose and accessory sinuses, but to impress upon the rhinologist some of the more or less constant anatomy of this honey-combed area: then having in mind this basic anatomy ask ourselves if we shouldn't be more conservative in the treatment of their diseased states.

This very essential anatomy is too frequently overlooked, and the function of the nose and sinuses is too often interfered with. We must not forget that our aim in diseased conditions, especially of this area, is to return the nose to as near its normal conditions as possible, with the least amount of damage or destruction to its tissues. The nose acts as the protector of our air passages by cleansing and modifying the air currents passing through it. Therefore, the size of the openings of the two sides should be as nearly equal as possible, with turbinates in situ and the mucous membrane in normal condition.

With the normal nose in mind we examine to see if the air chambers are equal in size and if not, what makes the difference. Metzenbaum has pointed out that certain physical conditions within the nose have a marked bearing on sinus involvement. These he lists as: a. a superior, posterior deflection of the septum; b. a bullous middle turbinate usually accompanied by polypoid degeneration; c. a middle turbinate, normal in size close to the sinus wall; d. a shelf-like inferior turbinate lying across the nares.

No doubt a deflected septum is to blame for many of the troubles in the nose. It is not only out of line itself, but causes pressure atrophy of the turbinates on one side, and nature in trying to equalize the air currents enlarges the turbinates on the other side, and with these bulgings, thickenings, hypertrophies, and hyperplasias, the air is not properly filtered or modified and the drainage and aeration of the sinuses are interfered with.

Therefore, the intranasal conditions which predispose to accessory sinus disease are particularly those interfering with normal ventilation of the sinuses.

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*Read before the Eye, Ear, Nose and Throat Section, West Virginia State Medical Meeting, Wheeling, W. Va.

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Today the pendulum is starting its backward swing toward conservatism in the handling of sinus cases, because in the past too much normal tissue has been removed, which not only took away protection but left non-functioning scar tissue.

Let us look first at the underlying anatomy of the maxillary sinus. This, the largest of the pneumatic cavities, lies to the outer side of the nasal fossa and resembles in form a three-sided pyramid. It occupies the greater portion of the superior maxilla bone, so that its walls are very thin and often in places of papery delicacy. The median wall or base is directed toward the nasal fossa from which it is separated by a thin osseous partition formed by the palate bone, uncinate process of ethmoid, inferior turbinate and a small portion of the lachrymal. Above is the orbital wall. The anterior wall presents toward the face. Below, it projects into the alveolar process almost reaching the roots of the molar teeth. Internally are the ethmoid cells and occasionally, the sphenoidal sinus.

The normal ostium is on the upper anterior wall and opens into the middle meatus via the hiatus semi-lunaris which empties into the ethmoidal infundibulum.

One must always recall the possibility of dealing with: a. a maxillary sinus incompletely divided by septae into subcompartments; b. congenital dehiscences in the walls of the sinus; c. accessory ostia; d, abnormalities and anomalies such as overdeveloped or enlarged sinus, abnormally small sinus, peculiarly shaped sinus.

However, valuable information may be learned of the size, contour, and relationship of the maxillary sinus by use of X-ray.

Andrews, in writing on surgery of the ethmoid labyrinth, calls attention to the function of the middle turbinate bones. He points out the tendency to maxillary sinus disease following the removal of the middle turbinate. He believes that one of the functions of the middle turbinate is to protect the antrum, probably by leading discharge from the frontal sinus and anterior ethmoidal cells away from the antrum and to cause the discharge to drop free into the nasal cavity. Another function of the middle turbinate is to direct part of the air current past the ostium maxillare in such a way that it will rarify and condense the air in the antrum with each inspiration and expiration.

That the middle turbinate and ethmoid cells have a function in maintaining a proper lumen of the nostril is indicated by the fact that after removal the patient usually finds himself unable to prevent the discharge accumulating in the area once occupied by these structures. Continued crust formation is a common sequel. The discharge in this locality harbors and favors the development of

micro-organisms which frequently invade adjacent cavities—the frontal, maxillary, and sphenoidal sinuses.

What is more brilliant than the everyday teaching of Skillern, in his paper the "End Results of the Radical Operation on the Accessory Sinuses", in response to the question from his associates as to what is the ultimate condition of the patient after a radical on the frontal ethmoid. Is not this learned teaching an argument for conservative treatment rather than radical surgery. Or could not this thesis be used as an excellent argument for conservatism in sinus surgery. Of the maxillary sinus, he says, "Certain false steps may be the cause of one of the following:

a. "Anesthesia of the upper lip and teeth on the operated side; b. Permanent fistula formation into the mouth; c. Excessive dryness of the nose on the affected side; d. Gradual return of the discharge after apparent cure."

The frontal sinus, according to Schaeffer originates from an anterior ethmoidal cell which in turn was the frontal recess. The sinuses are roughly triangular in shape and as a rule not symmetrical, one cavity being enlarged at the expense of the other, with a displacement of the intervening septum.

The frontal sinuses do not appear as distinct spaces until about the seventh year, and do not attain their full size until after puberty. The anatomy of the adult frontal sinus varies greatly, there being no constancy in size, shape or type. The boundaries of the normal sinus being, in front, the supra orbital portion of the frontal bone, behind by the cerebral wall, and below by the orbital plate. The communication between the frontal sinus and the nose is formed by the frontal ostium, which lies on the posterior inferior surface of the inferior triangle in a position almost corresponding to the posterior wall of the sinus.

"There is no unvarying typical type of frontal sinus," says Schaeffer, "great variations are encountered." "While it is true," he adds, "that the right and left sinuses are separated by a bony partition, it is equally true that the dividing partition is rarely located in the mid-sagittal plane." He lays stress upon the clinical fact that the maxillary sinus is frequently a cesspool for drainage from the frontal region. Anatomically, he shows that the relationship between the infundibulum ethmoidale, and the sinus frontalis or its duct, is so intimate, that drainage from these paranasal chambers finds its way into the infundibulum ethmoidale, to the ostium maxillare, and thence through into the maxillary sinus.

Of the frontal sinus on the supposition that an external operation through the brow with removal of one or more of the walls has been

performed, the following more or less permanent unpleasant results may follow according to Skillern:

a. Persistence of pain; b. Hemianesthesia of the brow and scalp; 3. Persistence of the discharge; d. Neuralgia about the cicatrix; e. Diplopia; f. Epiphora and finally blindness, meningitis and fistula formation.

Stucky in his very timely discussion of Harris' paper on "Causes of failure in the radical operation in the frontal sinuses", states that the radical frontal often fails because we destroy the function of the sinus. The frontal sinus, like all the accessory cavities, is an air chamber, and our surgery must do more than surgery of any other part of the body, we must maintain ventilation and drainage or the function of that sinus is destroyed. Aeration is absolutely necessary to its function. In his judgment, no portion of the body has greater recuperative or reparative power than the attic of the nose if we would but give it a chance. He believes a great deal of harm is done by over-treatment of cases through interference with the functions of the nose.

The ethmoid labyrinth embraces all that portion lying between the two lateral plates of the orbit. It is impossible to say, in many instances, whether a cell belongs to the anterior or posterior ethmoidal group merely from its position, hence, Schaeffer prefers the classification be based on the location of the ostium. He divides the anterior group which communicates with the middle meatus into:

a. Frontal or pre-ethmoidal group, cells communicating with frontal recess; b. Infundibular group, cells communicating with the ethmoidal infundibulum; c. Bullar group, cells communicating with the region of ethmoidal bulla.

The posterior cells are somewhat more regularly placed, one being forward at the junction of the middle and superior turbinate, one lying laterally, and one posterior and superior, there is, however, no constancy in the number of posterior ethmoidal cells.

The anatomic relations to this field is indeed noteworthy. Recall, if you will, the relative position of the optic nerve at the foramen, how thin the bony wall is which separates it from the cells, and how, as the nerve courses forward toward the eyeball, it diverges more and more from the posterior ethmoid cells. Schaeffer reminds us of this relation in connection with blindness of nasal origin, and also points out how infection of this field may extend into the orbit, giving rise to an orbital cellulitis. The cranial fossa, he adds, may be involved, and ethmoidal infection extend via the ethmoidal veins, or the very intimate opthalmic vein may carry infection into the dural cavernous sinuses.

Of the ethmoids I am afraid that our limitations, as far as the surgical anatomy of this area is concerned, are oft-times overlooked. The present day literature has been literally crowded with new operative procedures.

Surely, no one part of sinusology has been more juggled about than have the ethmoids, and truly there is no sinus condition where it is easier to advise operation than it is on this fenced-off region. What an easy task it is to go in and break down cells which, without proper authority, we say are diseased. Here again, Skillern mentions the following untoward results or complications:

a. Continuance of the discharge; b. Continuance of the pain; c. Partial occlusion of the nostril; d. Ocular symptoms which did not obtain previous to operation.

The importance of the ethmoid labyrinth is better appreciated when we realize that it is involved to a greater or less extent in all intranasal inflammatory conditions. One with considerable experience in dealing with these ethmoids would have in mind the anatomic variations which he is liable to encounter, and thus approach each case in a cautious manner. Ethmoid operating is not such a simple procedure as one might first think. The post-operative complications may be dangerous, more so, perhaps, than any other intranasal procedure.

What is the topography of the sphenoid? Dorsally or posteriorly is the hypophysis cerebri and sometimes the brain stem. Laterally, (the thinnest wall), are the dural cavernous sinuses, with the internal carotid artery, the third, fourth, and sixth cranial and ophthalmic and maxillary nerves. Above is the optic commissure, below the vidian nerve, posterior nares and nasopharynx.

The vertical wall projects dorsal and below forming an obtuse angle at its junction with the cribriform plate of the ethmoid. It contains the ostium.

It is essential for ophthalmologists to understand the relationship which exists between the accessory sinuses and the optic nerve and chisms, because disease of the sinuses may lead to optic neuritis, even blindness. Especially the sphenoids and posterior ethmoids concern us in this connection. In a vast majority of the cases the optic commissure bears an intimate relation to the sinus. The commissure is frequently above one or both sinuses. Then the thickness of bone intervening between the sinus and optic commissure varies from a papery delicacy to that of a substantial thickness.

The two most important sequellae which may follow surgery on the sphenoid mentioned by Skillern are:

a. Gradual closure of the opening before suppuration has ceased; b. Reinfection with intermittent suppuration.

When a patient undergoes an operation, particularly on these areas he expects to be cured and should some slight trace of the old symptoms or signs linger or new ones appear, it is bound to be a source of dissatisfaction. Correct surgery should be founded on physiologic and anatomic factors, and so it is in the treatment of these cavities.

Stucky calls attention to the needless and often dangerous use of surgical interference in the treatment of acute infection of the nasal accessory cavities, because the average case of acute infection of these cavities will yield to medical treatment aided by the mildest and least irritating local treatment. He also pleads for a wider range of medical knowledge and for a more thorough appreciation of the relationship of diseases of the nose and ear to general conditions.

He points out one important fact, often overlooked, that the treatment of pathologic conditions in otorhinology differs from that of any other portion of the body in that these cavities with their accessories require constant ventilation as well as constant drainage, or the existing pathologic conditions cannot be permanently eradicated.

Finally, we know that these sinus cases are particularly prone to make the rounds. They enjoy consultations of the collective nature where a number of specialists get together to decide whether this case should or should not be operated. Such a method appeals powerfully to the patient and his friends. It is popular, dramatic and probably worthless.

The diagnosis of these difficult cases and the question of operative procedure can best be established by the work of an individual surgeon, who conducts a routine and careful examination to which he is willing to devote unlimited time. When all his data are available, he may perhaps with profit lay them before one or more of his colleagues, and get the latter to check doubtful points which his work has revealed. This is not the method of the sensational novelist, but it is the method which best subserves the interests of our patients.

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THE TREATMENT OF BRAIN ABSCESS.*

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At a meeting of the New England Otological and Laryngological Society in Boston on Nov. 27, 1923, I read a paper entiled, "The Treatment of Brain Abscess by Unroofing and Temporary Herniation of Abscess Cavity With the Avoidance of Usual Drainage Methods". This paper will soon appear in one of the numbers of *Surgery, Gynecology and Obstetrics,* but inasmuch as it has not yet been published, I shall review some of the subject-matter before you tonight, with a report of an additional case.

All operative procedures heretofore described in the treatment of brain abscess have been based upon three well recognized principles: *1*, The drainage of the abscess cavity; *2*, prevention of extension of meningeal infection; *3*, prevention of hernia cerebri.

Various authors have described different methods of exposures for the purpose of drainage of an abscess cavity. Adson has advised an osteoplastic flap with drainage of the abscess cavity, the drain being brought out through a separate trephine opening made through the osteoplastic flap. Eagleton has advised the reversed osteoplastic flap for abscesses located in the middle fossa and frontal region. Dowman and Kerr have advocated exploration for and drainage of the abscess cavity through a small trephine opening in the skull. However, in each of the procedures advocated, without regard to the type of exposure, the intention of the surgeon has been to locate and drain the abscess cavity by means of some kind of drainage material and to prevent herniation of the brain.

In the rather large number of fatal cases, death usually occurred from rupture of the abscess cavity into the ventricular system, meningitis, or compression of the brain, or death may have resulted from any two or all of these causes.

DIFFICULTIES AND DANGERS OF USUAL DRAINAGE METHODS.

Although there have been reported numerous isolated cases of recovery, not infrequently does secondary abscess develop in the neigh-

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The author is indebted to Drs. John McCoy and Stuart L. Craig, of the New York Eye and Ear Infirmary, for the courtesy of permitting him to operate upon Case 1; and to Dr. John A. Hartwell, Director of the Second (Cornell) Surgical Division, Bellevue Hospital, for permitting him to operate upon Cases 2 and 3 and 4, as well as for helpful criticisms of the paper; De Witt Stetten for his aid in general in the writing and criticism of the paper.

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borhood of the intended drainage tract or substance employed for drainage and the case ends fatally. In many cases, rather than a real "secondary" abscess developing, a pocket of pus may accumulate in some portion of the abscess cavity and fail to be drained. This type of abscess frequently enlarges, ruptures into the ventricle, and death results.

There have been numerous drainage materials suggested, devised and used, among which are: gauze packing, glass tubes, rubber tubes, rubber tissue, strips of rubber dam, tubes made of wire mesh, conical-shape wire mesh drains, metal searchers, etc. Although isolated cases of recovery have been reported with practically every type of drain enumerated, no author has reported any lengthy series of cases of recovery by any type of drainage, nor has the average operator been able to claim a low mortality rate. In other words, no type of drain really "drains"; that is, drains in the sense that a complete permanent obliteration of the abscess cavity takes place, followed by a high percentage of recoveries.

It has frequently been observed by various operators, that following drainage of the cavity, introduction of drainage material, and allowing the drain to remain in position for a long period of time, that the patient's condition gradually improves to the point where he is able to leave his bed and be up and walking about, when a secondary abscess develops and terminates with a fatal result. In my own experiences with the use of rubber drainage tubes and rubber tissue, I have seen several patients recover from a stuporous or semi-comatose condition, to the point where they state that they felt well, they ate and slept well and were able to be up and about the ward without any serious symptoms. After a period of perhaps several weeks, a secondary abscess developed, which ruptured into the ventricle and death ensued.

Drains may also become dislodged and are replaced with difficulty. In fact, at autopsy it has been found that drains were not replaced in the sense that they followed the original tract, but were found to have been inserted into the brain tissue outside of the tract. Early removal of drains and dislodgement of drains with attempt to replace them, have undoubtedly been frequently followed by fatal results. Even at the time of operation, after a partial evacuation of the abscess cavity has taken place, it has been observed that in the attempt to insert a drain into the abscess cavity, such an attempt has failed. At autopsy, it has been found that the drain has not been inserted into the abscess cavity, but is in the brain tissue outside of the cavity. This is especially likely to occur in encapsulated abscesses, in which partial evacuation of the contents of the cavity had been done, fol-

lowed by a partial collapse of the cavity and the cavity becomes "lost", so to speak. Fatal results have also followed perforation into the ventricle by drainage tubes, in attempts to replace a drain, or by undue pressure or displacement of a dressing.

REASONS FOR DISCARDING USUAL DRAINAGE METHODS.

In the past, I have used various types of drainage material, such as rubber tubes, rubber dam and rubber tissue and have seen the cases terminate fatally, although immediate improvement may have taken place following the operation and progressive improvement for several days or weeks. On the other hand, in 1920, I operated upon a case of encapsulated temporo-sphenoidal lobe abscess of the left side, following a simple mastoidectomy. The expose of an area of dura about the size of a one-half dollar was made. The capsule of the abscess cavity was covered with about ½-inch thickness of brain cortex. The cavity was entered and exploration, irrigation and cleansing of the cavity were accomplished through a crucial incision in the dura and a tract made through the cortex and capsule with an artery clamp. After the cavity had been thoroughly irrigated with Dakin's solution, drainage materials, consisting of the following were inserted through the crucial incision: a rubber tube about 2 inches long and about ½ inch in diameter, with a lateral opening at the distal end, was placed against the floor of the abscess cavity and four narrow gauze packing strips, wet in Dakin's solution, were placed about the tube. Irrigation of the larger tube was done every two hours, by placing a small rubber tube in the lumen of the larger tube without removal of the drain.

After several days it was observed that herniation of the brain was taking place. The tube was displaced outward with the abscess cavity and about three weeks following the operation the hernia had protruded to such an extent, with a resulting shallowing of the abscess cavity, that the tube had to be considerably shortened. A few days later the entire remaining piece of the drainage tube was removed for the reason that the abscess cavity had become so shallow that it would not retain the tube. In the meanwhile the operative site, including the brain hernia, was irrigated with Dakin's solution. With this treatment, the hernia began to recede and after two months, following the operation, the hernia had completely receded and had become covered with epithelium except for a central area about the size of a quarter. One week later, the site of the hernia was completely covered with epithelium. The patient was discharged from the hospital with complete recovery and has remained well up to the present time.

Comment: Although it was the intention of the operator to drain the abscess cavity and prevent herniation of the brain, hernia cerebri developed with extrusion of the drainage tube. In spite of the herniation which occurred, with no other treatment than dakinization of the wound and dressings which prevented pressure on the hernia, the hernia receded and the wound was completely healed within two months and one week following the date of operation.

About three weeks after operation upon the above mentioned case, I operated on another temporo-sphenoidal lobe abscess of the left side, practically identical in location, shape, size and encapsulation as the case described above. In this instance, I located the abscess cavity, entered and evacuated its contents, irrigated the cavity with Dakin's solution and instituted the same type of drainage as in the previous described case. In this instance I was able to drain the abscess through a much smaller opening in the skull, so that herniation of the brain did not take place. The patient recovered from a semi-comatose condition to the point where he was able to be up and about the ward and about the hospital grounds. Secondary pockets formed on two occasions after the patient had been up and walking about, each time necessitating patient's return to bed, with a return of the stuporous, semi-comatose condition. In each instance the cavity was again entered and drained. Following the evacuation of the first secondary pocket or abscess which occurred, the patient's general condition again improved and he was up and walking about, after which another secondary abscess formed and drainage was again instituted. Although the patient improved to a certain extent following the drainage of the secondary abscess which developed, he never recovered to the extent as was observed following the drainage of the original abscess and the first secondary abscess. The infection finally spread and the patient died as a result of rupture of the abscess into the ventricle.

Several months later I operated upon a frontal lobe abscess, instituted drainage which allowed the patient to recover from a semi-comatose condition, to the point where he was up and about the ward, when a secondary abscess occurred with rupture into the lateral ventricle, terminating in death.

After having had this experience, I began to consider closely the questions of drainage and the desirability or undesirability of temporary herniation of the brain. In the first case, evacuation of an abscess cavity had been accomplished through a rather large trephine opening through which a hernia cerebri subsequently occurred—the patient recovered. In the other two cases briefly described, similar

drainage had been instituted through smaller trephine openings in which herniation did not occur—both patients died.

It is also well known that during the late war, a number of deaths were prevented in cases, in which there was gross cranial and intracranial injury, by removal of a large mosaic of fragments of skull and considerable amount of damaged brain tissue and in which cases subsequent herniation of the brain occurred. A great number of these patients recovered and came under the observation of the Chiefs of the Neuro-Surgical Services here in hospitals in the states, where the cranial defects were repaired. We have had cases of compound depressed fractures of the skull in Bellevue Hospital, in which the wounds were infected, suppuration occurred and hernia cerebri developed. The hernia receded with no other treatment than protective dressings and dakinization of the wound.

This question then arose in my mind: Why not, at the time of the original operation, provide a rather large trephine opening or cranial defect, directly over the site of the abscess; pack off the sub-dural and sub-arachnoid spaces to prevent extension of infection; "unroof" the abscess cavity by completely removing the overlying brain substance; completely empty the remaining portion of the abscess cavity; allow temporary herniation of the brain to take place through the cranial defect produced, so that no drainage with drainage materials will be required; and let the subsequent treatment consist of irrigation of the area with Dakin's solution and prevention of trauma to, and early compression of, the hernia by protective dressings, followed by recession of the hernia and epithelialization of the wound. After prolonged consideration of this matter, I came to the conclusion that this was the proper procedure and that cases, which should come under my observation thereafter, would be treated in such manner.

Four cases of brain abscess consecutively operated upon by me in this manner recovered, are well today, and all are self-supporting. Upon observations made in these four cases, the conclusions have been arrived at and stated in this paper. The etiology, pathology, symptomatology and diagnosis of brain abscess will not be discussed, as the literature is replete with papers on these phases of the subject.

TECHNIQUE OF OPERATION.

Anesthesia: Local anesthesia with novocain solution 1 per cent and ½ per cent with suprarenin, is the anesthesia of choice. I have seen no ill effects from the use of this solution as a local anesthetic with the patients operated upon. In most cases the patient is already drowsy, stuporous or semi-comatose.

The solution is injected in a circular direction with a diameter of the circle being about 4 inches, around the site where the cranial de-

fect is to be created. This allows of rapid injection and at the same time obviates entering an infected field and thus spreading of infection in case an infected wound is present. Not more than 100-125 c.c. of the solution will be required. Dunn's apparatus for the injection of the solution has proved to be satisfactory.

Incision: The preferred incision is three or four, i. e., cucial limbed, so that the point of apposition of the apices of the scalp flaps will coincide with the site of the trephine opening. The presence and position of a wound may alter the incision. The incision is carried through to the outer table of the skull and the flaps consisting of the scalp, subcutaneous tissue, musculature and pericranium are elevated, reflected and held with self-retaining cranial retractors. The apices of the flaps are turned outward and sutured loosely to the flaps so as to prevent their becoming adherent too early to the surface of the hernia which will form, and to prevent the apices of the flaps from turning under and becoming adherent to the undersurface of the flaps. The retractors afford adequate exposure and prevent hemorrhage from the margings of the flap by traction and pressure, so that no artery clamps will be needed for this purpose. The exposure of the skull is therefore more rapid and is accompanied by practically no hemorrhage. If an infected wound of the soft parts is present, this is excised along one limb of the operative incision. A trephine opening is made in the central portion of the exposed outer table of the skull with a Hudson bone drill, bits A and B being used. A small incision about ¼" long is then made in the dura, so as to allow of exploration with a blunt, hollow needle or canula. When the abscess cavity is entered by the needle and pus is obtained, a small amount of pus is removed for bacteriological examination, the location of the abscess is indicated, the needle is withdrawn and the trephine opening is enlarged with Ronguers, until it is about the size of a silver dollar or larger. It is enlarged in a direction so as to correspond with, and directly overlie, the abscess cavity. If the abscess is located directly beneath the trephine opening, enlargement of the cranial defect will be concentric with the trephine opening. If the abscess cavity is located more anterior or more posterior or inferior, or more superior, then the opening is enlarged in the direction indicated, so that the original trephine opening may then be in the periphery of the cranial defect created. The dura is then divided in a stellate fashion, creating six pennant shaped flaps which are reflected over the bony margin of the cranial defect, and loosely sutured with fine plain catgut to the underlying surface of the scalp flaps. Small narrow strips of iodoform gauze (three pieces) are then lightly packed or "insinuated" beneath the margin of the circular defect created in

the dura, so as to wall off the sub-dural and sub-arachnoid spaces and prevent extension of infection into these spaces. (Three short pieces of gauze are more easily removed than one long piece.) The blunt exploring, hollow needle or canula is again inserted into the abscess cavity, so as to again definitely locate the cavity, after which a one-half inch incision is made through the brain tissue (and capsule, if one be present) overlying the cavity, with a sharp Bard Parker knife, blade No. 11 being used. A soft rubber catheter, about No. 18 F., with a 20 c.c. Luer syringe attached, is then inserted into the incision and most of the contents of the cavity are then carefully withdrawn, so as to prevent the contents of the abscess from running over and soiling the field of operation. The cavity is then washed out repeatedly with Dakin's solution until the pus is grossly removed.

The incision in the cortex or "roof" of the abscess is carried to a point on the margin of the cavity and then around it in a circular manner, so that the entire "roof" of the cavity is removed—completely "unroofing" the cavity. It is essential that a sharp knife should be used for this purpose. When normal brain tissue is cut, one anticipates a considerable amount of bleeding. Practically no bleeding, only slight oozing, occurs when the brain tissue overlying an abscess cavity is cut and removed.

As soon as the abscess is evacuated, the patient's condition improves. The pulse which in most cases is slow, now arises to between 70 and 110. Respiration and the general condition improves, so that he is less stuporous, is more susceptible to the external influences, oftentimes is able to talk and answer questions and may become restless and may have to be restrained on the table.

The cortical margins about the abscess cavity will fall away from the dura unless adhesions have already taken place. If adhesions are present, they should not be separated, as their presence will be of value in the prevention of spreading of infection into the sub-dural and sub-arachnoid spaces. In fact, these spaces may be completely shut off by the adhesions. The cavity is then thoroughly irrigated with Dakin's solution and gently sponged or wiped out with cotton pledgets, so as to completely remove the contents of the cavity. No attempt is made to remove the "capsule" if one is present. In fact, a "capsule" tends to prevent too marked herniation of the brain.

After the roof of the abscess cavity has been removed, it will be observed that the floor of the abscess cavity becomes less concave, flattens out and tends to rise somewhat into the operative field, thus diminishing the depth of the remaining portion of the abscess cavity.

No drainage tubes or other drainage materials are inserted into this remaining portion of the abscess cavity. A fenestrated rubber dam

is placed over the cavity, its margins coinciding with the operative field, over which small pieces of gauze wet in Dakin's solution are placed, so that the rubber dam "dimples" somewhat into the cavity. The original three pieces of iodoform gauze which were placed around the dural opening are not removed or changed. These pieces, during the procedure, adapt themselves into the margin of the sub-dural space and tend to prevent leakage into the sub-dural and sub-arachnoid spaces, better than if they were changed and new ones introduced.

The intention of the procedure is, first, to remove the contents of the abscess cavity, and, second, to remove the roof of the cavity so as to allow the remaining portion of the cavity to herniate outward through a cranial defect which is intentionally placed directly over the abscess. The rubber dam is used to protect the surface of the after-forming brain hernia—it offers better protection than does gauze or any other substance which might be used, in that, there is no trauma to the hernia in its removal and at the same time allows of dakinization of the hernia on account of its being fenestrated. The rubber dam is then covered with a piece of gauze, wet in Dakin's solution, three perforated Dakin tubes are then placed over the gauze, so that afterward the entire area will be kept thoroughly wet with Dakin's solution* and a copious wet Dakin gauze dressing consisting of flats and headroll applied. Both ears are covered with several layers of vaseline gauze to prevent irritation by the solution. If the abscess is frontal in location, it is advisable to cover one or both eyes with vaseline gauze and include them in the dressing. Vaseline gauze is not applied to the scalp about the wound until the first dressing on the following day, as the scalp will withstand dakinization for twenty-four hours without irritation. The entire dressing is held in place with wet gauze bandages, including the head and the lower jaw, so as to prevent removal or displacement of the dressings by the patient.

This procedure is equally applicable in the treatment of abscesses whether located in the frontal or temporo-sphenoidal lobes (with or without extension into the parietal or occipital lobes) or cerebellar regions, or for those abscesses which are secondary to an old infected compound fracture or osteomyelitis of the skull. These groups form the greater majority of all brain abscesses. Likewise, single metastatic abscesses, which are comparatively rare, are amenable to this type of operation. For multiple metastatic abscesses, no surgical procedure can be expected to offer relief. If the abscess is located in the parietal lobe (which is unusual) necessitating a partial removal of the cortex, a monoplegia, or even an hemiplegia, is to be preferred

to a fatal result. In those cases of cerebellar abscess, where the abscess is situated on the anterior surface of the cerebellum, and the lateral sinus is involved, the approach described by Eagleton, with ligation and division of the lateral sinus probably will give best results.

In the small remaining group of cases where the abscess is basilar in position, and no opportunity is offered for removing the wall of the abscess and allowing of herniation, the two stage procedure described by Dowman is probably the operation of choice, if the abscess can be located.

In recapitulation, the procedure described in this paper is applicable for all cases of brain abscess, in which the "roof" of the abscess can be removed and the abscess cavity can herniate through the cranial defect. Fortunately, these cases are most frequently met with and comprise the vast majority of all brain abscesses.

POST-OPERATIVE TREATMENT.

The after-care of the patient, with attention to details, is most important and should be carried out by the operator himself or by an assistant who thoroughly understands the post-operative care. The patient should be dressed daily for a prolonged period of time. The cardinal points in the after-care of the patient, which will result in recovery, are, *1*, allowing of temporary herniation of the brain, carrying with it the remaining portion of the abscess cavity; *2*, combatting of infection by the use of Dakin's solution; *3*, prevention of trauma to the brain hernia during the period of combatting infection and the subsequent recession of the hernia; *4*, prevention of over distention of the ventricular system by means of lumbar puncture, if indicated; *5*, strapping of wound with adhesive strips after the slight necrosis on the surface of the hernia has ceased and the surface of the hernia has become covered with healthy granulations followed by recession of the hernia with epithelialization.

Dressings: For several weeks dressings should be done daily, beginning at the first day after operation. Dakinization of the wound is commenced immediately after the patient is returned to the bed from the operating table, the instillation being made every hour. Vaseline gauze should completely cover the scalp for protection from the dakinization solution and be removed and replaced at each dressing.

At the first dressing, the entire dressings should be removed, with the exception of the three small pieces of iodoform gauze which have been placed about the margin of the defect to protect it at the subdural and sub-arachnoid spaces. At this time, that is, twenty-four hours after operation, it will be observed that the abscess cavity has become somewhat herniated outward, has become much more shallow

and may have reached the level of the inner table of the skull. If not, this level will have been reached by the second or third day.

I have devised an apparatus which has simplified the dressings and, at the same time, effectually served for the purpose of dakinization of the wound and protection of the brain hernia. It is circular in form and consists of a large rubber tube about three-quarters of an inch in diameter, which forms a tubular ring. Fixed to the inner margin of this ring is a perforated Dakin's tube which completely encircles the hernia with one end protruding for connection with the irrigating bottle. Overlying this ring is a dome-like cap made of rubber dam, which is fastened to the upper margin of the ring. Placed about the outer margin of the ring are four loops of linen thread situated 90° apart, which serve for the purpose of fixing the apparatus to the head with adhesive strips. After the entire scalp surrounding the wound has been covered with vaseline gauze, the apparatus is placed directly over the wound and fixed in position and connected with the Dakin's bottle. The adhesive strips fix the apparatus sufficiently to prevent displacement. Pieces of fluff gauze covered with combines are then placed about the apparatus without making compression in order to absorb the Dakin's solution after its instillation. This dressing is loosely held in position with a bandage. The connecting rubber tube from the bottle is clamped off so that all the time which is required for irrigation of the wound is just about two minutes. The clamp is released, wound is flooded with dakinization and the tube is again clamped. With this apparatus one is assured that proper dakinization of the wound takes place, and at the same time, the abscess cavity will be allowed to herniate into the apparatus without pressure being made upon it.

This same procedure is repeated each day until about the sixth day when the hernia will have passed out of the cranial cavity and the abscess cavity will have become everted or turned inside out, so to speak, so that the concave area of the cavity has become the convex surface of the hernia. The hernia is smaller in cases where a capsule is present than in cases of non-capsulated abscess. At this time the hernia will have assumed a mushroom shape, overlapping the small iodoform gauze packings about the margins of the defect. These should at this time be carefully removed, so as not to traumatize the hernia. If gauze packing is not re-inserted between the scalp flaps and base of the hernia, the scalp flaps will have become attached to the site of the hernia, which might result in the adherence of flaps to the hernia and in the forming of small pockets at the base of the flaps in the space between the base of the flaps and the base of the hernia. In order to prevent such an occurrence, it is considered

advisable to lightly pack strips of gauze wet in Dakin's solution, between the scalp flaps and the brain hernia so as to allow the flaps to first become attached to the hernia, at the base. Throughout successive dressings, these light gauze strip packings are inserted to a lesser depth than on the preceding day, thus allowing the scalp flaps to become gradually attached to the hernia from the base upward. When the space between the base of the flaps and the base of the hernia has been obliterated, the loose sutures which have held the apices of the flaps in an everted position are removed, and the flaps allowed to become adherent throughout to the lateral surface of the hernia. Care should be taken that the apices of the flaps do not roll inward upon the flap and become adherent to the undersurface of the flap or that the margins themselves do not roll in. If so, the hairs from the scalp will grow out and downward against the surface of the brain hernia, irritate the surface of the hernia, prolong infection, and delay epithelialization of this area. The holding of the apices of the flaps in an everted position for several days will prevent this occurrence.

The hernia may become of considerable size, from the size of a small lemon to that of a small orange; that is, a mass from about 1½ inches in diameter to that of three or four inches in diameter and protrude above the level of the scalp for a distance of one to two inches. *The hernia should not be cut away;* neither should it be compressed *at this time.* The hernia is kept protected with the apparatus and the entire area is kept thoroughly irrigated with Dakin's solution. In other words, after the hernia has formed, the following indications are: *1*, to protect the hernia from pressure and trauma; *2*, to prevent over-herniation by lumbar puncture; *3*, to keep the area thoroughly irrigated with Dakin's solution; *4*, to keep the patient quiet in bed during the first three or four weeks, while the hernia is at its maximum size, with avoidance of physical exertion. Bowels should move daily.

In order to prevent excessive herniation of the brain after the abscess cavity has become everted, lumbar puncture, with removal of 10 to 25 c.c. of fluid from time to time, should be done, after the first two weeks have passed. By this time the area about the defect has become well walled off and the likelihood of spreading of infection in the meninges will have passed. The size of the hernia will immediately decrease during the lumbar puncture, while the fluid is being withdrawn. The herniation mass instead of being tense will become soft, "flabby", somewhat flattened out and may even become depressed in its central portion. In case of temporo-sphenoidal lobe abscess, where the herniating mass consists of brain tissue for the

most part, the recession of the hernia following lumbar puncture will not be as great as in the case of a frontal lobe abscess, where the herniating brain substance is thinner and the surface of the anterior horn of the lateral ventricle is nearer the surface of the brain hernia. In such a case, that is, a frontal lobe abscess, the hernia recedes entirely within the cranial cavity and forms a depression. In such cases, the amount of fluid removed by lumbar puncture should be less, so as not to create a negative pressure within the ventricle and thus bring about the danger of possible rupture into the ventricle from without. The intention should be to remove only enough cerebrospinal fluid to lessen the intracranial pressure sufficiently to do away with the possibility of rupture of the ventricle from within outward, through the hernia, from marked increase of intracranial pressure. Lumbar puncture should not be done in the first few days following the operation, for fear of extension of infection.

In the cases observed there were slight areas of superficial sloughing of the hernia. These areas of sloughing are on the surface and are not greater than 1/16 to ⅛ inch in depth. It has not been observed that they have been deep seated or tended to extend into the depth of the hernia, but have always been limited to thin superficial sloughing. These superficial sloughs should not be removed until after they have become completely loosened (except that the margin which as already become loosened should be clipped away with scissors), i. e., no attempt should be made to dissect the slough away from the brain tissue. If so, slight bleeding will occur with the possibility of extension of infection into the hernia and a repetition of the sloughing at this site. The slough which has been observed has been chiefly that of the wall of the everted abscess cavity itself and the cut margin of brain substance about the original abscess cavity, made by the knife in "unroofing" the cavity. Gross sloughing of the hernia itself has not taken place.

After about three or four weeks, the surface of the hernia will become covered with healthy red granulation tissue, which will give to the surface of the hernia a greater resistance. The surface will become somewhat fibrosed and will not increase suddenly in size with coughing and sneezing as it does in the earlier stages before fibrosis or partial cicatrization has taken place. The hernia will also begin to diminish in size, becoming less and less from day to day. It will be observed that epithelium has begun to grow out over the surface of the hernia, extending from the margin of the scalp flaps. At this stage the surface of the hernia should be covered with strips of perforated adhesive plaster exerting slight pressure. In order to fix the adhesive so that it will

not be loosened by the Dakin's solution, a strip of adhesive about two inches wide should be placed around the head so that the ends come to within about three inches of either side of the site of the hernia. To this strips of adhesive the several smaller pieces of adhesive covering the hernia can be fastened and they will not be loosened by the Dakin's solution. These strips should be removed daily during the first week or two of strapping of the hernia, on account of the secretion which accumulates about the strips. A gauze dressing wet in Dakin's solution should be applied over these strips and it should be kept wet with Dakin's solution and a syringe, from without, every two or three hours. The epithelium grows rather rapidly beneath the adhesive strips, so that finally only a small granulating surface remains after the area has been strapped for about two weeks. The patient ordinarily will be up and about the ward by the time the strapping is commenced. The small granulating area in the center of what was the hernia, finally becomes completely covered with epithelium, leaving a healthy non-hair-bearing scar, usually somewhat triangular in shape, this being the space between the margins of the retracted scalp flaps.

The average time which will be required from the time of operation until the hernia has completely receded and the granulating surface has become covered with epithelium is about two to three months. The level of the site at which the hernia occurred, has now become flattened, the hernia is completely subsided, or the area may even be slightly depressed.

SUMMARY OF REPORT OF CASES:

Case No. 1. M. L., New York Eye and Ear Infirmary. No. 2838. Russian Hebrew, age 28 years, occupation, cutter of men's clothes. Service: Dr. John McCoy. Admitted July 5, 1920.

History: Four weeks before admission, had severe pain in left ear. On following day ear drum was punctured. Drained for about ten days. Drainage suddenly ceased, followed by pain behind the ear in region of mastoid process. On day previous to entering hospital there was pain behind left ear.

July 7, 1920, simple mastoidectomy, left.

July 22, 1920, *operation* for brain abscess, temporo-sphenoidal lobe, left. Encapsulated abscess containing thick, yellow pus. Streptococcus. Thickness of cortex overlying abscess cavity about 1.2 c.m.

Large opening made into abscess cavity. Short thick rubber drainage tube inserted; held with four gauze packings. Herniation of abscess cavity occurred; complete about thirteenth day with eversion of abscess cavity. Treatment consisted of irrigation with Dakin's solution. Thirty days following operation hernia markedly receded.

Fifty-seven days after operation hernia completely receded, with no other treatment than keeping area clean with Dakin's solution. Sixty days after operation wound completely healed. Highest temperature, 101.2° on second day.

In this case, herniation of brain was not intended nor desired; it occurred, however, resulting in eversion of the abscess cavity, without formation of secondary abscess. Recovery.

Follow-up note: Nov. 14, 1923. Patient stated that he was discharged from New York Eye and Ear Hospital on Oct. 7, 1920, to his home. He was not confined to his house at any time since his discharge from the hospital. He went out daily and looked for work. He felt perfectly well. He was unable to obtain work until about ten weeks after his discharge on account of a strike, at the end of which time, however, he succeeded in getting a position as a cutter of men's clothes, a position similar to the one which he held before his illness. He continued at this work without interruption, except for his yearly vacation, until September, 1923. He then gave up his position and opened his own store at Coney Island. He is part owner of a cigar and stationery store and continued at this until the present date. This work, in addition to his usual duties within the store, entails delivery of newspapers to the residents of Sea Gate, and requires a considerable amount of walking. He was married in November, 1921. At the present time he is in perfect health and has no complaints whatsoever. While in hospital in July, 1920, before the mastoid operation, he weighed 135 pounds. Upon discharge from hospital, 155 pounds, after having remained at Burke's Foundation for about two weeks, at which time he returned home, he weighed 165 pounds. At the present time, three years and four months following operation, his weight is 175 pounds.

Otological examination (Dr. Stuart L. Craig), Nov. 2, 1923: "His hearing is practically normal. Drum shows some scar tissue in posterior segment and some thickening, but is in fair position. The mastoid area shows a depressed scar, edges smooth and entirely healed. The area over the temporo-sphenoidal lobe shows no hernia."

Case No. 2. T. W., Bellevue Hospital, brain abscess, No. 15, male, Russian-Pole, age 46 years; occupation, blacksmith; admitted Second (Cornell) Medical Division, Mar. 17, 1923.

History: On February 22, 1923, while working as blacksmith in a roundhouse for a railroad company in Pennsylvania, he fell and struck the right side of his forehead against an upturned chisel and received a wound of the right frontal region. He was not unconscious. The wound was sutured by the company's doctor without radiographic plates having been made. He remained in the hospital

about ten days, at the end of which time he again resumed his work for a period of five days. On account of pains in his head he gave up his work. The wound never completely healed. He had severe pains in his head, which he tried to relieve by drinking liquor. He came to New York and walked to Bellevue, to which institution he was admitted.

Physical examination: An inflamed, lacerated wound about 1½ inches long, right frontal region. General physical examination negative.

Three days after admission developed slight facial weakness of left side.

Seven days after admission patient decidedly lethargic but when aroused he could talk. He was unable to use his hands properly, especially the left hand.

Physical findings: Slight left facial weakness, spasticity of left arm and leg, choking of both discs, increased reflexes on both sides.

Ophthalmological note: No nystagmus. No paresis or paralysis of ocular muscles. Right pupil greater than left, very slight response to light. Fundi: papilloedema, right, with circumscribed retinal edema. Numerous hemorrhages and spots of exudate. Left fundus: optic neuritis with little elevation of discs.

Diagnosis: Brain abscess frontal lobe, right, secondary to compound fracture right frontal region.

Mar. 26, 1923, *operation* for brain abscess, frontal, right. Local anesthesia. Large encapsulated pear-shaped abscess. Thick, yellow pus; streptococcus hemolyticus. Exposure by making large cranial defect overlying abscess cavity with frontal sinus curettement and removal of overlying cortex about 1.5 c.m. in thickness. No drains. Partial herniation of abscess cavity before operation completed: maximum herniation about seventh day after operation. Daily dressings. Dakinization of wound. Rather thin-walled hernia overlying anterior horn right lateral ventricle completely receded in seventy-one days. No leakage of cerebro-spinal fluid. Highest temperature 100.6° on third day after operation. Discharged from Bellevue on 101st day following operation with no complaints. Weighed before injury 166 pounds; weighed 132 pounds before admission; weighed 170 pounds when discharged from hospital. General condition excellent. Recovery.

Follow-up note: No information about patient until Aug. 22, 1923, when it was reported by an attorney for the Polish missions for the diocese of Pennsylvania that he was in Philadelphia. On Nov. 8, 1923, it was learned that he had gone to West Virginia, where he had resumed work. He returned to New York, gave a

very detailed report of his trip to Pennsylvania to obtain compensation; went to Bellevue and was operated upon on Feb. 9, 1924, a scalp plastic being performed. He was discharged on Feb. 27, 1924.

Case No. 3. C. D., Bellevue Hospital, brain abscess, No. 14; male, age 26 years, occupation, fireman, New York City fire department; admitted Mar. 26, 1923, service of Dr. T. A. Smith, Director of Fourth Surgical Division.

History: Patient stuporous and could give but little history. From his sister it was learned that three weeks before admission he was operated upon in another hospital for mastoiditis, left side, simple mastoidectomy being done. Previous to the mastoid operation he had influenza, after which is left ear drum was punctured.

Physical examination: Patient stuporous but can be aroused by examination. Answers questions very slowly. Blood pressure 120-80. Temperature 100°. Pulse 70.

Neurological note: Patient stuporous and therefore incooperative Local condition not examined. Bilateral early papilloedema, right greater than left. Slight facial weakness and pyramidal signs on right side. Astereognosis right side. Impression of superficial examination: Brain abscess, temporo-parietal, left.

Surgical note: Diagnosis: Brain abscess, temeporo-sphenoidal lobe, extending into parietal lobe, left, secondary to mastoiditis, with simple mastoidectomy, left.

Cardinal points: *1*, Drowsiness or stupor; *2*, infected post-operative wound following operation for mastoiditis, left with inflammatory zone about wound and unhealthy granulation tissue in wound; *3*, astereognosis, right; *4*, history: symptoms beginning about two or three weeks after operation for mastoiditis; *5*, engorgement of retinal veins, especially left; *6*, sensory aphasia; *7*, right facial weakness.

Operation for brain abscess advised, to be done as soon as possible.

Otological note: Right ear negative. Left ear shows post-operative simple mastoidectomy. Drum is gray. There is no bulging or signs of an acute middle ear infection. Post-auricular wound has small piece of old gauze packing: on removal a dirty wound was seen filled with sero-purulent material. Granulations seen beneath are of an unhealthy type. No connection is noted between the antrum region and wound. No cord-like mass is felt in neck.

Diagnosis of temporo-sphenoidal lobe abscess is concurred in and operation advised.

Through the courtesy of Dr. T. A. Smith, patient was transferred to Second (Cornell) Surgical Division for operation.

Mar. 27, 1923, *operation.* Local anesthesia. Pathological findings: external mastoidectomy wound as described above. Dura had been exposed at time of last operation, area being about size of a dime. At this site dura adherent to cortex. Through a trephine opening made about one inch above exposed area of dura a puncture was made with blunt brain canula and rather thin, oily pus was obtained at first puncture. Staphylococcus aureus. Opening was enlarged until a cranial defect about two inches in diameter was made. Cortex about 1 c.m., thick, overlying abscess cavity removed. Abscess was non-encapsulated. First contents evacuated, rather thin oily pus; residual contents of cavity thick and contained necrotic brain material. Abscess considered to be of rather recent formation. Herniation of floor of abscess noticed on table. No drains.

Summary of post-operative course: Dakinization of wound. Daily dressings. Large brain hernia reaching its maximum about eighth day. Complete eversion of abscess cavity. Hernia completely receded in forty-four days aided only by one lumbar puncture on thirty-first day. Dakin's solution used throughout. Dressings to protect and to prevent compression for thirty-nine days, after which slight compression dressing with granular surface covered with adhesive plaster strips. Highest temperature 100.8° F. on first day after operation. Leakage of clear cerebro-spinal fluid through hernia from seventh to twelfth day. Discharged on sixty-seventh day. Weighed 145 pounds when first out of bed; weighed 170 pounds when discharged. General condition excellent. Recovery.

Nov. 14, 1923. *Follow-up note.* Returned to duty as fireman in New York fire department "watch duty" and messenger. Sept. 7, 1923, five months and eleven days after operation. This duty entailed work both during the day and night. On Oct. 6, 1923, he was transferred to day duty as inspector of garages, fire hazards, etc.; is on such duty at the present time. Now weighs 190 pounds. General health excellent. Recently underwent an operation at the New York Eye and Ear Infirmary on Dr. McCoy's service for removal of nasal polyp.

Although homonymous hemianopsia developed when the hernia was at its maximum size and remained until after the hernia receded, at the present time the vision is normal.

On Mar. 3, 1924, he was admitted to Second Surgical Division, Bellevue Hospital, where I performed a scalp plastic under local anesthesia. He was discharged from the hospital twelve days after the operation, on Mar. 16, and after a few days, returned to duty. He states that he feels as well as he ever did.

Case No. 4. A. S., age 22 years, male, American; occupation, bank clerk. Admitted to Ward B1, Second (Cornell) Medical Division, Bellevue Hospital, Sept. 17, 1923. Readmitted to our service on Feb. 7, 1924.

Short summary of case: While serving in navy, in Santo Domingo, D. R., was shot in the head, right side. Unconscious for twelve hours. Operation: for compound depressed fracture of skull, right fronto-parietal region. Wound healed, but in about three weeks suppurated, was incised; discharging sinus until Jan. 2, 1923. Wound remained closed. No further trouble until Sept. 17, 1923. Mind confused all day. In afternoon, convulsions, generalized. Brought to hospital in unconscious condition. Remained in semi-conscious or stuporous condition for several days, when on Sept. 23, six days later, there was a fluctuating point in the scar and the patient was practically symptom-free. Radiographic plates which had been ordered could not be found, Sept. 26, 1923. Operation: local excision of infected fluctuating portion of scar, wound packed wide open. Culture: staphlycoccus aureus. No tract or fistula found leading into brain abscess. No sequestra found. Deep exploration. No X-ray plates; possibility that was superficial abscess of scar or scalp, and condition cleared up when it pointed. Thought symptoms might be due to inflammatory process in cortex and meninges adjacent to wound. Probability of abscess discussed, but considering that his symptoms had disappeared, considered best not to explore further. In few days patient up and about ward. On Oct. 13, 1923, after wound had been well dakinized and was clean, the wound and scar were excised by Dr. Martin and the scalp edges approximated. Oct. 21, when sutures were removed, no evidence of infection. On Oct. 23, two days later, middle portion of scar appeared inflamed, separated, but no pus. Convulsions occurred on this day and had several convulsions daily until Oct. 31, when they ceased, coinciding again with appearance of discharge of small amount of pus from wound. Without further operative procedure discharge ceased. Patient discharged from the hospital Nov. 11, 1923, with instructions to report at once if he developed symptoms.

It was believed at the time that there was probably, or possibly, an old, chronic, brain abscess associated with an old G.S.W. of head, due to the following: Two distinct attacks, or series, of convulsions, which disappeared as soon as wound opened and discharged. Radiographic plates showed sequestration—small pieces of bone, either about the outer margin of the bone defect or in the brain substance. Allowed to go home, but with the belief that he would soon probably return. Again had convulsions. Returned to our service and was

operated upon for brain abscess Feb. 28, 1924. A small sinus was found leading down into a well walled-off abscess cavity containing pus and sequestra. "Roof" of abscess, which in this case was already perforated by sinus, was excised. Sequestra removed. Firm adhesions about area; but little tendency to herniate; tissue firm and fixed. Apparatus applied. Dakinization by patient. Herniation less than in other cases. Apr. 2, thirty-third day, up and about the ward, wound almost covered with epithelium. Apr. 9, 1924, discharged, completely healed. Now working as collector until scalp plastic. Weight 138 pounds.

CONCLUSIONS.

1. Various operative procedures heretofore described, in which numerous kinds of drainage materials were used, have usually been followed by a high mortality rate.

2. In all of these procedures described, prevention of *hernia cerebri* has been desired.

3. In this paper, the operative technique and post-operative treatment embraces the following: *1*, Creation of a rather large cranial defect directly over abscess cavity; *2*, complete "unroofing" of the cavity; *3*, complete herniation or eversion of the cavity; *4*, dakinization of area throughout treatment; *5*, prevention of trauma and early compression of hernia cerebri; *6*, recession of hernia; *7*, adhesive plaster strapping; *8*, epithelialization.

4. Results. Four cases consecutively operated upon in this manner have recovered. No mortality rate.

114 East 54th Street.

A NEW ANTISEPTIC TREATMENT—PRELIMINARY NOTE.

Dr. Ellison L. Ross, Chicago, Ill.

It is common knowledge that chlorine and iodine are strongly bactericidal. In considering an antiseptic, the power to kill bacteria alone must not be the only factor. The penetrability of the drug and injury to the tissues are often quite as important as getting rid of the major part of the infection. Chlorine and iodine used as such in solution are always either injurious to tissues or very brief in action. This objection is for the most part obviated in the case of chlorine in the preparations of "dichloramin-T" and "chlorazene". These compounds liberate atomic chlorine and act like dilute chlorine solutions renewed over a considerable period of time thus doing little or no injury to tissues and still destroying bacteria effectively.

To obtain a preparation which slowly liberates atomic iodine the author has devised the following method. The area to be treated is sprayed with 2 per cent solution of potassium iodide, and after the tissues are well saturated with this solution, the same area is sprayed with ½ per cent chlorazene. As the chlorine is set free from the chlorazene it takes the place of the iodine in the potassium iodide and the iodine is set free. This is clearly demonstrated by spraying two spots on a starched towel with the potassium iodide solution and then spraying one of them with the chlorazene solution. The last spot will be blue due to the starch-iodine reaction.

This atomic iodine treatment of acute infections of the nose and throat has been tried out in a limited number of cases. The author has used it in about fifteen cases, including acute rhinitis and acute pharyngitis. Some cases were severe streptococcic infections and others were of the ordinary type. The results vary from a cure in twenty-four hours to a 50 per cent improvement after one treatment. Dr. J. Gordon Wilson has used the treatment in about one dozen cases and reports that it is of decided value.

The treatment is carried out in the following manner for acute rhinitis. The nose is cocainized especially well about the middle

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turbinates. This is not necessary in most cases on account of the irritation caused by the treatment, but serves chiefly to shrink the tissues so that the drugs can be applied to all parts of the nasal passages thoroughly. The potassium iodide solution is sprayed well into the nose. After several minutes to allow complete permeation with the potassium iodide, the chlorazene is lightly sprayed in the infected area. Care is exercised not to overdo the last spraying and wash off the first solution. After fifteen minutes these two solutions are sprayed on again. A third application is given fifteen minutes later.

The author is continuing work on the treatment.

The American Board of Otolaryngology was organized in Chicago on November 10. The following constitute the board of directors: Dr. Harris P. Mosher, Boston, president; Frank R. Spencer, Boulder, Colo., vice-president; Hanau W. Loeb, St. Louis, secretary and treasurer; Thomas E. Carmody, Denver; Joseph C. Beck, Chicago; Thomas H. Halsted, Syracuse, N. Y.; Robert C. Lynch, New Orleans; Burt R. Shurly, Detroit; Ross H. Skillern, Philadelphia; William P. Wherry, Omaha. The office of the Board is at 1402 South Grand Boulevard, St. Louis, Mo. The Board comprises representatives of the five national otolaryngologic associations: the American Otological Society, the American Laryngological Association, the American Laryngological, Rhinological and Otological Society, the American Academy of Ophthalmology and Otolaryngology, and the Section of Laryngology, Otology and Rhinology of the American Medical Association. The object of the association is to elevate the standard of otolaryngology, to familiarize the public with its aims and ideals, to protect the public against unqualified practitioners, to receive applications for examination in otolaryngology, to conduct examinations of such applicants, to issue certificates of qualification in otolaryngology and to perform such duties as will advance the cause of otolaryngology. The first examination will be held at the time of the meeting of the American Medical Association.

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